The Journal of
NERVOUS and MENTAL DISEASE

VOL. 127, NO. 1
JULY, 1958
SERIAL NO. 911

THE LIMBIC SYSTEM WITH RESPECT TO SELF-PRESERVATION AND THE PRESERVATION OF THE SPECIES[1]

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However jealously we may ... have defended the independence of psychology from all other sciences,... we are here overshadowed by the immutable biological fact that the living individual serves two purposes, self-preservation and the preservation of the species, which seem to be independent of each other, which we have not been able to trace back to a common source, and whose interests often conflict in animal life. Here we are really discussing biological psychology, we are studying the psychological concomitants of biological processes.

Sigmund Freud: *New Introductory Lectures on Psycho-Analysis*, pp. 124–125, 1949.

Experimentation during the past two decades has provided evidence in support of a postulated dichotomy in the function of the phylogenetically old and new cortex (25, 13). This dichotomy—or schizophysiology as it has been called (15, 17)—has important implications for neurology and psychiatry because of its relevance to distinctive attributes of emotional and intellectual behavior.

The structural basis for this dichotomy was implicit in the anatomical findings of Broca that were published in 1878 (1). He demonstrated that a large cerebral convolution, which he called the great limbic lobe. is found as a common denominator in the brains of all mammals. He chose the word "limbic" to indicate that this lobe surrounds —literally, forms a border around—the brain stem. The greater part of the "old" cortex is found in the limbic lobe. Experimentation has shown that this primitive lobe is also, physiologically speaking, a common denominator of a variety of emotional and viscerosomatic functions in the mammal.

The relative constancy in the development of the limbic cortex throughout the phylogeny of the mammal stands in contrast to the rapid evolution of the neocortex which mushrooms around it. In contradistinction to the limbic cortex, the neocortex might be likened to an expanding numerator representing in phylogeny the growth of intellectual functions.

The phylogenetically old cortex may be broadly subdivided into two types, (i) the archicortex, so called because it is the first type of cortex to differentiate, and (ii) the mesocortex which derives its name from the fact that it is intermediate in position and structure between the archicortex and surrounding neocortex. The archicortex and mesocortex envelop the ring–like limbic lobe in two concentric bands. The mesocortex which forms the outer band makes up most of the superficial cortex of the limbic lobe and extends somewhat beyond its bound-

[1] The substance of this paper was presented at a symposium on the neurophysiology of emotional behavior arranged by the Neurophysiological Group of the American Physiological Society, Atlantic City, April 16, 1956, and again at "La Semaine Neurophysiologique de la Salpêtrière," Paris, France, October 10, 1956. Aided by research grants from the Foundations' Fund for Research in Psychiatry; the National Institute of Neurological Diseases and Blindness of the National Institutes of Health, U. S. Public Health Service, and the National Science Foundation.

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aries as perilimbic cortex. In evolution, the inner band of archicortex becomes largely buried through a process of folding, and in higher forms it undergoes so much displacement by the corpus callosum that the bulk of it comes to lie in the hippocampus in the inferomedial part of the temporal lobe.

It is to be emphasized that the limbic cortex is structurally primitive compared with the neocortex and is essentially similar in all mammals. This would suggest that it functions at an animalistic level in both animal and man. Furthermore, the limbic cortex, in contrast to the neocortex, has a wealth of large connecting pathways with the hypothalamus. These include the medial forebrain bundle, stria terminalis, fornix and mammillo-thalamic tract. Recently Nauta (23) has confirmed Cajal's findings (29) of a sizeable bundle of fibers in the fornix that project to the tuberal nuclei which sit astride the portal circulation of the pituitary. As suggested by physiological studies (17), it has also been learned through the work of Nauta that the limbic cortex has strong reciprocating connections with the central grey and paramedian reticulum of the midbrain (24). These nervous structures together with the hypothalamus play a fundamental role in integrating the performance of mechanisms involved in self–preservation and procreation.

Other structures associated with the limbic cortex include the septum, amygdala, anterior and midline thalamic nuclei, the habenula, and parts of the basal ganglia. It has become evident that the limbic cortex and its subcortical cell stations comprise a functionally integrated system. In keeping with Broca's terminology, this system may be appropriately referred to as the limbic system (14). Unlike the term rhinencephalon[3], which has commonly been used to apply to this system, the word limbic, as Broca pointed out (1), implies no theory in regard to function. It also has the advantage of being a short as well as a descriptive term.

With continued investigation it is beginning to appear that respective portions of the limbic system are predominantly concerned with emotionally determined functions pertaining to the *preservation of the self* or to the *preservation of the species*. This paper will single out for emphasis recent findings that have suggested such a functional localization with respect to these two basic life principles.

FINDINGS PERTINENT TO SELF–PRESERVATION

As illustrated in Figure 1, one can identify by means of strychnine neuronography five regions of interrelated limbic and extralimbic cortex. The region shown in stipple will be referred to as the frontotemporal region. It embraces the interrelated cortex of the orbital, insular, temporal polar, and pyriform areas, all of which "fire" into the amygdala and the archicortex contained in the segment of the hippocampus proximal to the amygdala. This region receives a confluence of afferents from the lateral olfactory tract and ascending pathways from the brainstem (cf. Fig. 2).

The frontotemporal region has been subject to much investigation because it is so often the site of injury and disease resulting in psychomotor epilepsy. The complemental findings of ablation and stimulation studies indicate that this region is primarily concerned with functions that insure *self–preservation*.

An analysis of stimulation studies in unrestrained and waking animals reveals that responses obtained from intermixed points within the frontotemporal region fall prin-

[3] According to Elliot Smith (31), "The term 'rhinencephale' was originally applied by St. Hilaire to a type of uniocular monsters without any direct reference to a region of the brain.... Richard Owen [an English biologist who lived from 1804–1892] subsequently introduced the term ... to distinguish those parts of the brain ... known as the olfactory bulb and the olfactory peduncle." In 1890, the English anatomist Turner reintroduced the term to refer not only to these structures, but also to the lateral olfactory tract and pyriform lobe. Since then, His and others have variously applied the term to these and other parts of the brain, with the result that one finds general confusion in the literature as to what it signifies.

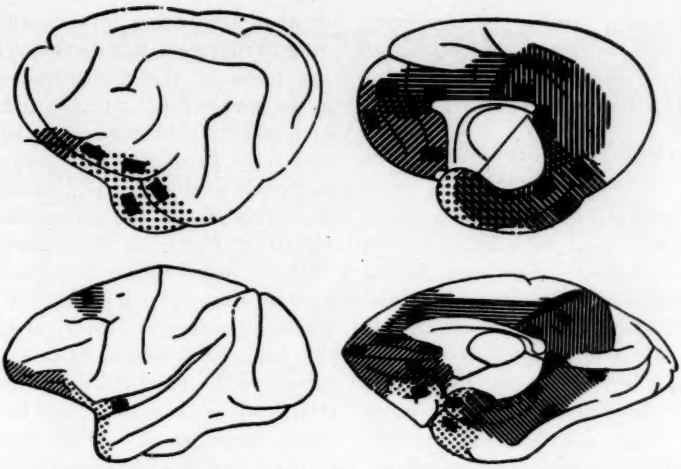

FIG. 1. Various shadings represent five regions comprising limbic and extralimbic cortex that can be differentiated by physiological neuronography (21, 27). The frontotemporal region is shown in stipple. Top two figures show lateral and medial surfaces of cat's brain; bottom two figures are corresponding representations of monkey's brain. (From MacLean, EEG Clin. Neurophysiol., 4: 407–418, 1952.)

cipally into two categories (10, 5, 14, 20). One category includes responses of an alimentary nature such as licking, chewing, eating, retching, etc. In the other category are responses that one associates with the animal's search for food and its struggle for survival. These include sniffing, searching, and angry attack or defense with appropriate vocalization.

Patients who suffer from psychomotor epilepsy as a consequence of epileptogenic foci in this region show comparable manifestations during their seizures (26). At the same time, they have symptoms that lend insight into the subjective functions of this region. In keeping with the automatisms that appear, they commonly experience during the aura alimentary symptoms and vivid emotions. There may be alimentary feelings of thirst, hunger, or nausea, whereas the emotional feelings are characteristically fearsome or unpleasant in nature. Feelings of fear, terror, dread and sadness may be associated with a sense of epigastric distress, suffocation, choking, or a racing heart. Sometimes the patient will experience an alternation of opposite feelings, a manifestation which suggests that there may be a reciprocal innervation of feeling states comparable to the reciprocal innervation of muscles (17).

Bilateral ablations of the frontotemporal region in animals appear to abolish a number of self–preservative functions related to eating and self–protection. In an extension of Klüver and Bucy's classical studies (11), Pribram and Bagshaw showed that the removal of this region in wild animals results in tameness and docility (27). There is an apparent loss of fear, and the animals will expose themselves again and again to the same harmful situation. Ordinarily frugivorous, the monkey post–operatively will eat raw meat or fish. It will put feces or nuts and bolts in the mouth and sometimes swallow them. In short, such an animal loses the ability to look after its self–protection and to eat properly.

From the foregoing findings, one is led to infer that the frontotemporal portion of the limbic system is largely concerned with survival mechanisms involved in obtaining and assimilating food. The role of this primitive part of the brain in regard to self–

preservation has a number of significant implications for psychiatry and psychosomatic medicine that have been discussed elsewhere (14, 16).

FINDINGS PERTINENT TO PRESERVATION OF SPECIES

Curiously enough, in addition to tameness, animals with bilateral ablations of the frontotemporal region reveal exaggerated sexuality that is often bizarre in nature. This was well illustrated by the experiments of Schreiner and Kling in which they removed part of this region in cats (30). Male cats would indiscriminately mount other male cats, a female dog, a female monkey or even a chicken. These findings suggest the occurrence of a release, in a Jacksonian sense, of other parts of the brain involved in procreative functions.

This leads to the consideration of another group of related limbic structures that seem to be involved in forms of behavior which taken together, might be interpreted as being conducive to the preservation of the species, rather than the self. As will be indicated, continuing investigation is beginning to suggest that a neural system involving parts of the hippocampus, cingulate gyrus, and septum is implicated in pleasure and grooming reactions and sexual manifestations. Long ago Cajal (29) emphasized the close anatomical relationship of these structures which are schematically represented in Figure 2. The figure illustrates that the septal region is a place of confluence for sensory data coming by way of the medial olfactory tract and ascending from the brainstem. From what is known of functional localization, the structures associated with the septum are in a position which might possibly allow the association of the somatogenital sense with the visual and olfactory senses.

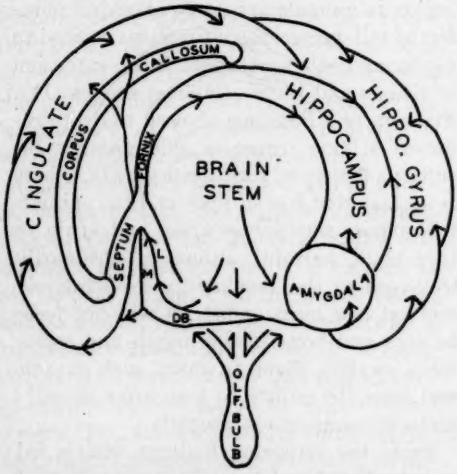

FIG. 2. Schematic drawing, indicating divergence of pathways from brain stem and olfactory bulb into respective portions of the limbic lobe. See text in regard to functional implications. DB, diagonal band; L, lateral septal nuclei; M, medial septal nuclei; OLF, olfactory.

In the course of investigating the structures under consideration, we have employed a method that allows one to perform chemical or electrical stimulation of the brain and at the same time to record the EEG and behavioral changes in unrestrained and waking animals.[4] It is basically a stereotaxic method which involves the implantation of needle guides in the skull of an animal through which insulated needles with lead-off wires can be subsequently introduced into desired points of the brain without the use of anesthesia. Chemical stimulation has usually been carried out by depositing micro-amounts of cholinergic drugs in crystalline form. Among the reasons for resorting to this type of stimulation was the belief that the prolonged action of the drug might bring to the fore behavioral changes that would not become apparent during short-lasting electrical stimulation.

One series of experiments on cats has focused attention on an intermediate segment of the hippocampus lying between frontal planes A1.5–A4.5 of Horsley-Clarke coordinates (18, 19). Figure 3 shows the track of a needle that was used to deposit crystalline carbachol in this portion of the hippocampus. Figure 4 illustrates the elec-

[4] See Ref. 18 for detailed description of method.

FIG. 3. Microscopic section showing needle track in the intermediate portion of hippocampus that was investigated in the group of experiments described in text. In this instance a micro-amount of crystalline carbachol was deposited at the site where the track ended. (From MacLean, Arch. Neurol. Psychiat., **78**: 113–127, 1957.)

troencephalographic picture following such an application. The accompanying behavioral manifestations are found to correlate with three stages of the EEG changes: (1) the Stage of Development (top three tracings of Fig. 4), (2) the Stage of Culmination (middle tracing), and (3) the Stage of Subsidence (bottom three tracings). For the present discussion, only the behavioral changes occurring during the stage of subsidence need be considered. During the second and third hour when the seizure activity is abating, the cat characteristically manifests enhanced pleasure and grooming reactions (15, 19) and is unusually receptive to genital stimulation (19). By enhanced pleasure reactions is meant the appearance in a conspicuous form of those manifestations that are interpreted as signs of contentment and passivity in the cat. These include spontaneous loud purring, kneading and fanning of the forepaws; turning over on the back, rolling, twisting, stretching, and fanning of forepaws; rubbing head and body vigorously against inanimate objects or the examiner. Enhanced grooming refers to the appearance in a conspicuous and enduring form of grooming activity. Receptivity to genital stimulation, over and above its manifest meaning, implies the susceptibility of the male cat to the inducement of an erection. In our ex-

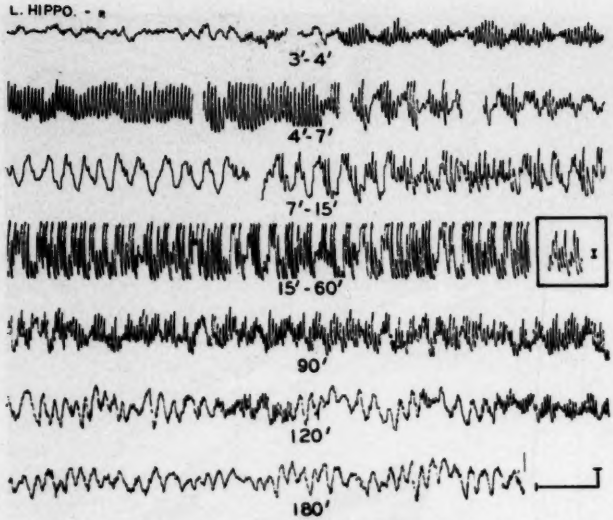

FIG. 4. Electroencephalographic excerpts illustrating three stages of seizure activity induced by deposit of crystalline carbachol in hippocampus: (1) Stage of Development, top three tracings; (2) Stage of Culmination, middle tracing; (3) Stage of Subsidence, bottom three tracings. Behavioral findings described in text are associated with Stage 3. (From MacLean, Arch. Neurol. Psychiat., **78**: 113–127, 1957.)

FIG. 5. If the high voltage seizure activity associated with Stage 2 of a carbachol-induced seizure fails to develop, an animal may show only unusual receptivity to genital stimulation and enhanced pleasure and grooming reactions that characterize Stage 3. Illustration above from moving pictures shows an induced, sustained penile erection in such an animal. (From MacLean, Arch. Neurol. Psychiat., **78**: 128–142, 1957.)

perience, and in the experience of others, it is only a rare male cat that will not resist and avoid genital stimulation.

If insufficient carbachol is deposited in the hippocampus to induce the high voltage seizure activity associated with Stage 2, the only noteworthy behavioral changes that become manifest are enhanced pleasure and grooming reactions and receptivity to genital stimulation. The same applies in regard to the application of methacholine or acetylcholine with physostigmine, which fail to induce the intense seizure discharges seen with carbachol. Figure 5 shows an induced sustained penile erection in a cat in which insufficient carbachol was applied to induce the high–voltage seizure activity associated with Stage 2.

It is to be emphasized that the foregoing changes in disposition are in marked contrast to the manifestations that occur if these cholinergic drugs escape from the hippocampus into the overlying ventricle. In this event, there results a syndrome characterized by contralateral circling and angry behavior (15, 17, 19).

Enhanced pleasure and grooming reactions were observed following 14 of 26 stimulations of the hippocampus. This compared with two such positive reactions following

28 stimulations in neighboring structures and elsewhere. They were not seen when empty needles or relatively inert substances were placed in the hippocampus. If the results of this exploratory study were subjected to chi square analysis, they would be highly significant ($P < 0.001$).

During electrical stimulation of the part of the hippocampus in question, one observes few, if any, noteworthy changes. If, however, an afterdischarge is produced, there occurs during and following it a number of pronounced alterations in behavior. The changes following the afterdischarge are pertinent here. The following account is broadly descriptive of the enhanced pleasure and grooming reactions observed in 21 of 34 cats following hippocampal afterdischarges (19). Shortly after the vocalization that signals the end of the afterdischarge, the animal commonly begins to scratch its head or body. Sometimes it will immediately bite near the stump of its tail or in the genital region. Afterwards there may follow a period of protracted intensive grooming. The grooming may from the start be largely confined to the genital region or may involve an orderly progression from head and forepaws, to body and hind limbs, to stump of tail and region of anus and genitalia. In the male cat a partial erection may appear in the course of protracted grooming of the genitalia. This occurred in the cat shown licking its genitals in Figure 6.

Intensive grooming activity may continue for several minutes, after which the animal may stretch out, purr, fan its forepaws and show other manifestations of contentment. If approached by the experimenter during the period of grooming, it characteristically manifests enhanced pleasure reactions. Cadilhac has made similar observations (2). Penile erection may easily be induced (19). It is striking to see the effect of hippocampal seizures on animals that have been trained in a shuttle box to avoid a shock following the sound of a buzzer. Ordinarily, a well-trained cat appears quiet, vigilant and somewhat apprehensive during such testing. Following a hippocampal afterdischarge, it is surprising to see such an animal become preoccupied with grooming and then stretch out in a relaxed attitude on the floor of the shuttle box fanning the forepaws while going off to sleep.

FIG. 6. Following electrically induced hippocampal afterdischarges, both cats and rats commonly engage in intensive self-grooming. The grooming may involve all parts of the body or focus from the start on the genital region. During grooming of the genital region partial penile erections may be seen. Such was the case of the animal shown in the cinematographic excerpt above. (From MacLean, Arch. Neurol. Psychiat., **78**: 128–142, 1957.)

It is significant that rats also show intensive self-grooming following hippocampal afterdischarges (17, 19). As in the cat, the grooming may last for several minutes, and here, too, one may see a partially erected penis when grooming focuses on the genital region.

In a series of related, but as yet unpublished, studies, Drs. Walter Lockhart, Bruce Trembly, and Chul Kim have stimulated the septal nuclei and cingulate gyrus. The medial septal nuclei are a source of affer-

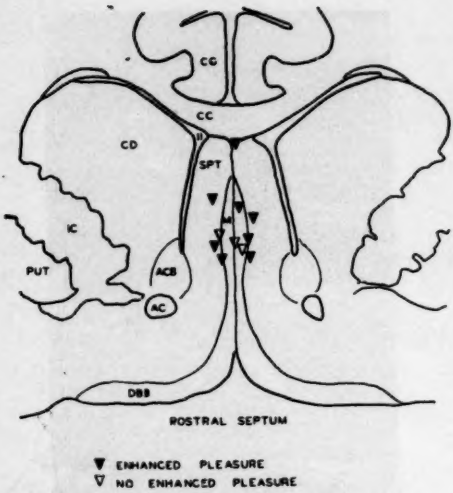

FIG. 7. Trembly has found that chemical stimulation in or near the medial septal nuclei of cats is followed by enhanced pleasure reactions (32). Triangles in above diagram indicate points of stimulation. Black triangle, positive response; open triangle, negative response. In a comparable number of stimulations at more rostral or caudal levels of the septum, enhanced pleasure reactions did not appear. AC, anterior commissure; ACB, nucleus accumbens; CD, caudate nucleus; DBB, diagonal band of Broca; M, medial septal nuclei; SPT, septum.

ents to the hippocampus. Trembly observed enhanced pleasure reactions in cats following eight of eleven cholinergic stimulations in or near these nuclei (32). Such responses were not seen following an equal number of stimulations elsewhere in the septal region. Figure 7 shows the localization of the positive points of stimulation. Kim has observed pleasure and grooming reactions following afterdischarges induced by electrical stimulation of the septum and in one instance noted a spontaneous penile erection. He has also seen spontaneous erections following electrical or chemical stimulation of the anterior supracallosal cingulate gyrus. Spontaneous or easily induced erections have been observed in a few instances by Lockhart during seizure activity induced by application of cholinergic drugs to the cortex just above the posterior cingulate gyrus (EEG illustration in Ref. 15).

This last observation calls to mind Erickson's case of hypersexuality in a 55 year old woman who had a tumor in the paracentral lobule which lies just above the cingulate gyrus (3). There are other relevant observations. In 1939 Harterius reported that electrical stimulation in the region of the septum induced ovulation in rabbits (6). In 1909 Von Bechterew stated that his collaborator, Pussep, elicited penile erection in the dog upon stimulation in the region of the anterior thalamus (33). These stimulations might have involved the anterior thalamic nuclei which are closely related to the cingulate gyrus. In an analysis of the extensive material of the Hess collection, Hess and Meyer have recently reported that the points of stimulation which most commonly led to grooming (Fellreinigung) were in the septal region (8). Other positive points were in the cingulate gyrus. The hippocampus was not explored.

Changes of an opposite nature that are seen following variously placed lesions in the structures under consideration would appear to offer further correlations. For example, following bilateral ablations of the anterior cingulate gyrus and *probably part of the underlying bundle of the cingulum*, Ward noted that monkeys showed "a loss of mimetic activity, grooming and signs of affection" (34). In 1936 Fulton and Ingraham reported that interruption of pathways in the region of the septum resulted in angry behavior (4), a change, it should be emphasized, that contrasts with the effects of frontotemporal lesions.

From the foregoing observations it might be inferred that a portion of the limbic system involving related parts of the septum, hippocampus, and cingulate gyrus is concerned with expressive and feeling states that are conducive to sociability and other preliminaries of copulation and reproduction. In other words, this portion of the limbic system, in contrast to the frontotemporal region, appears to bear on activities that are directed for the purpose of preserving the species rather than the self.

COMMENT

The pleasure, grooming, and sexual manifestations that have been described raise a number of provocative questions about cerebral organization and behavior: How do they possibly relate to the recent striking observations of Olds and Milner, who found that rats with electrodes implanted in the septum and other limbic structures would repeatedly press a bar to obtain electrical stimulation of the brain (22)?[5] How are they to be regarded in the light of the relief of tension, sometimes compared to the feeling state after orgasm, that some patients experience following psychomotor seizures? How are they to be considered with respect to the localization of morbid function in certain forms of psychotic behavior? What possible relevance do they have to the beneficial effects of electroshock treatment in which, as noted by Jung (9) and recently emphasized by Liberson and Cadilhac (12), the hippocampus is especially prone to seizure discharge?

Here it will be enough to deal with the first question and to consider it in the light of what has already been said about the possibility of reciprocal innervation with respect to emotional feeling states. The recognized emotions can be classified from the standpoint of self-preservation and the preservation of the species. Emotional feelings that are informative in regard to threats to self-preservation or to the preservation of the species, or to the eradication of these threats, are characteristically "unpleasant" in nature. In this category are fear, anger, and sorrow. On the other side are pleasurable feelings that are informative of the removal of threats, the active gratification of needs, and the temporary achievement of a state of internal and/or external homeostasis. The emotions of joy and love come conspicuously to mind.

[5] These findings have since been extended and essentially confirmed by J. V. Brady and J. C. Lilly, using cats and monkeys. The results of this work will be found in a forthcoming publication of the Henry Ford Symposium on the Reticular Formation, Boston, Little Brown & Co.

In psychoanalytic theory the pleasure principle is *in part* the principle that pleasure results from the *reduction of instinctual tension* (7). But if, as already suggested, reciprocal innervation applies to feeling states, it would make it possible to look upon pleasure in a less negative sense. In other words, pleasure might be thought to have its own specific machinery which ordinarily does not go into play until there is inhibition of mechanisms responsible for the subjective and objective manifestations related to threats to self–preservation and preservation of the species. This, incidentally, suggests how vicarious forms of oral and sexual activities would tend to check "instinctual tensions" and to give release to pleasurable feelings. It also makes it possible to visualize how under some situations the mechanisms for pleasure and displeasure might be brought into play simultaneously, seeming to allow, as it were, joy through suffering or providing the functional substrate for the psychological states of masochism and sadism.

In the experiments of Olds and Milner, it is possible that by self–stimulation of the brain the animal is taking advantage of reciprocal innervation within the limbic system whereby so–called instinctual tensions associated with self–preservation and preservation of the species are inhibited and replaced by pleasurable feelings of gratification of oral or sexual appetite. Or again, from what has been said about the organization of the frontotemporal region, it is easy to imagine how the interweaving of neural structures responsible for opposed effects would make it possible for the stimulating electrodes to activate simultaneously mechanisms responsible for pleasure and displeasure. This would amount to an experimental approximation of situations—some of which were mentioned in the previous paragraph—that are commonly referred to as perversities of Nature.

The nature of the mechanisms of the limbic system that have been dealt with in this paper has been conducive to focusing atten-

tion on the preservation and procreation of the animal being. If one were to proceed to a higher level and to speak of the preservation and procreation of ideas, it would be necessary to consider neocortical systems.

SUMMARY

The greater part of the phylogenetically old cortex is contained in the great limbic lobe of Broca. This lobe is found as a common denominator in the brains of all mammals. Together with its subcortical cell stations it comprises a functionally integrated system, which, in keeping with Broca's terminology, may be referred to as the *limbic system*. Evidence is cited which indicates that the frontotemporal portion of the limbic system is largely concerned with mechanisms that are involved in obtaining and assimilating food and are thereby essential to *self-preservation*. Attention is then turned to recent findings that are beginning to suggest that another portion of the limbic system, involving parts of the septum, hippocampus and cingulate gyrus, is concerned with expressive and feeling states that are conducive to the *preservation of the species*. Some of the implications of these new findings in regard to a number of provocative neurological questions are discussed.

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CIRCULATING EPINEPHRINE AND NOREPINEPHRINE IN CHANGING EMOTIONAL STATES[1]

PETER F. REGAN, III, M.D.[2] AND JOSEPH REILLY, PH.D.[3]

Emotions present a serious problem to psychiatry, in our present state of knowledge. That they are important in human behavior and physiology is self-evident; when an attempt is made to penetrate beyond the grossest type of emotional-physiological correlation, however, apparently clear relationships become confused in a welter of interacting factors. The present report describes some of the descriptive, diagnostic and personality features that may influence the relationship between levels of emotion and levels of circulating epinephrine and norepinephrine, as seen in a group of sixty hospitalized psychiatric patients. It is hoped that an awareness of these factors may provide helpful leads for further investigations, and for therapy.

METHODS

The present study deals with two sets of observations which were made at intervals of one month or more on sixty hospitalized psychiatric patients. Each observation consisted of an evaluation of the patient's emotional status, and a simultaneous determination of circulating catechol amine levels. The catechol amine determinations followed the procedure of Weil-Malherbe (14, 15, 18, 19), and were performed without knowledge of the clinical evaluation.

Because of the exploratory nature of this program, the clinical evaluation was kept at a simple level. All patients were well known to the senior author, who classified the patients in several ways. First, a diagnostic and psychopathologic classification was made, which followed accepted usage. Second, in the field of personality, the patients were placed into one of three categories based on the concepts of Funkenstein (9): a) Externalized blame—patient attributes illness to qualities of others in the past. b) Internalized blame—patient attributes illness to qualities of self in the past. c) Anticipation—patient attributes illness to expectations of the future. Third, each patient was evaluated in terms of his awareness of conflict, which was considered to be present if he recognized discrepancies between dynamically determined areas of his own personality, *e.g.* between sexual drives and ethical code. Finally, emotions were evaluated in terms of an Emotion Rating. This rating consisted of the sum of values given by the examiner to the patient's demonstrable levels of anxiety, tension, resentment, and depression. Each of these four emotions was given a value on a 1 to 3 intensity scale: 1—mild, 2—moderate, 3—severe, so that the Emotion Rating had a potential range of 0 to 12.

Factor Analysis. As a result of this procedure, a large quantity of information is available for analysis. The results reported in this paper adopt the following sequence of analysis. 1. Emotion Ratings are correlated with quantitative levels of circulating epinephrine and norepinephrine. 2. The direction of change in Emotion Rating between the 2 test occasions is correlated with the direction of change of the levels of epinephrine and norepinephrine, *e.g.* if the Emotion Rating rises, the epinephrine

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level rises, and the norepinephrine level falls, there is said to be a parallel emotion–epinephrine relationship, and a non–parallel emotion–norepinephrine relationship. 3. Patients are grouped into those who show parallel relationships between emotions and amines, and those who do not. 4. The parallel and non–parallel groups are analyzed for the occurrence and non–occurrence of the characteristics previously described. These several relationships were evaluated by the chi–square technique. The relationships to be discussed attained a probability level of 0.05 except when otherwise noted. Because of the limited population, however, this significance must be viewed with caution.

RESULTS

Group Values for Catechol Amines. The 120 tests, performed on 60 patients, revealed a mean epinephrine level of 1.35 micrograms/liter of plasma, and a mean norepinephrine level of 3.5 micrograms/liter of plasma (Table I). These results are similar to those previously described for psychiatric patients and for a group of healthy adults (14). Diagnostically, the patients fell into all major categories, in none of which did the values of circulating epinephrine or norepinephrine differ significantly from the mean value for the whole group.

Catechol Amine Values and Emotion Ratings. Circulating levels of epinephrine and norepinephrine were higher on the test occasion when the Emotion Rating was higher. Between the time of the high and low Emotion Rating, the mean epinephrine dropped from 1.5 to 1.2 micrograms/liter, and the mean norepinephrine dropped from 3.8 to 3.2 micrograms/liter. These results, while suggestive, do not achieve statistical reliability.

Parallel Emotion Rating–Amine Relationship. The Emotion Rating increased or decreased in some degree between the 2 occasions on which blood was obtained from the 60 patients. Epinephrine levels changed in the parallel direction in 42 instances, and norepinephrine changed in the parallel direction in 40 instances. These figures are statistically significant, but must be interpreted cautiously.

TABLE 1
Catechol Amines and Diagnosis

Diagnosis	No. Patients (2 tests)	Mean Epinephrine (μg/l)	Mean Norepinephrine (μg/l)
Schizophrenic Reaction	28	1.15	3.2
Depressive Reaction in Middle or Late Life	19	1.5	3.15
Manic Excitement	3	1.35	3.55
Psychoneurotic Reaction	7	0.9	3.9
Others	3	1.8	4.0
TOTAL	60	1.35	3.5

Analysis of Factors Influencing the Parallel Emotion Rating–Epinephrine Relationship. Certain characteristics appeared to favor the parallel relationship between the Emotion Rating and epinephrine levels (Fig. 1). These characteristisc were:

1. The presence of marked paranoid features. Such features were prominent in 16 patients, of whom 13 had a parallel relationship.

2. Personality—Externalized Blame. Of 17 patients with this characteristic, 14 had a parallel relationship.

3. Personality—Internalized Blame. Of 24 patients with the characteristic, 18 showed a parallel relationship.

4. Awareness of Conflict. Of 22 patients with this characteristic, 19 had a parallel relationship.

The total group of 60 patients could be divided into two subgroups; one subgroup composed of patients with one or none of the factors apparently favoring a parallel Emotion Rating–epinephrine relationship, and one subgroup of patients with two or three of these characteristics. The group with one or none of the favorable factors

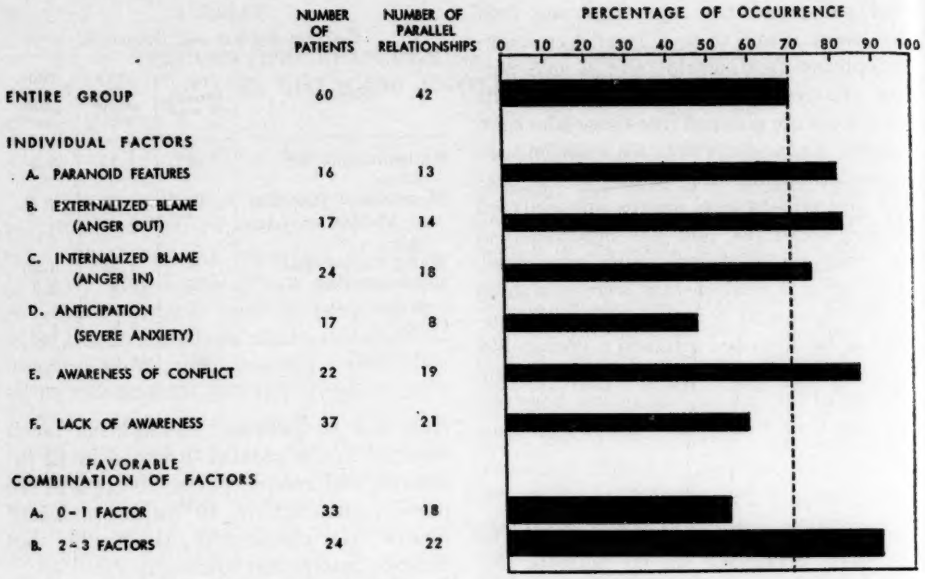
NUMBER OF PATIENTS
NUMBER OF PARALLEL RELATIONSHIPS
PERCENTAGE OF OCCURRENCE
0 10 20 30 40 50 60 70 80 90 100
ENTIRE GROUP 60 42
INDIVIDUAL FACTORS
A. PARANOID FEATURES 16 13
B. EXTERNALIZED BLAME (ANGER OUT) 17 14
C. INTERNALIZED BLAME (ANGER IN) 24 18
D. ANTICIPATION (SEVERE ANXIETY) 17 8
E. AWARENESS OF CONFLICT 22 19
F. LACK OF AWARENESS 37 21
FAVORABLE COMBINATION OF FACTORS
A. 0-1 FACTOR 33 18
B. 2-3 FACTORS 24 22

FIG. 1. Occurrence of parallel emotion–epinephrine relationship

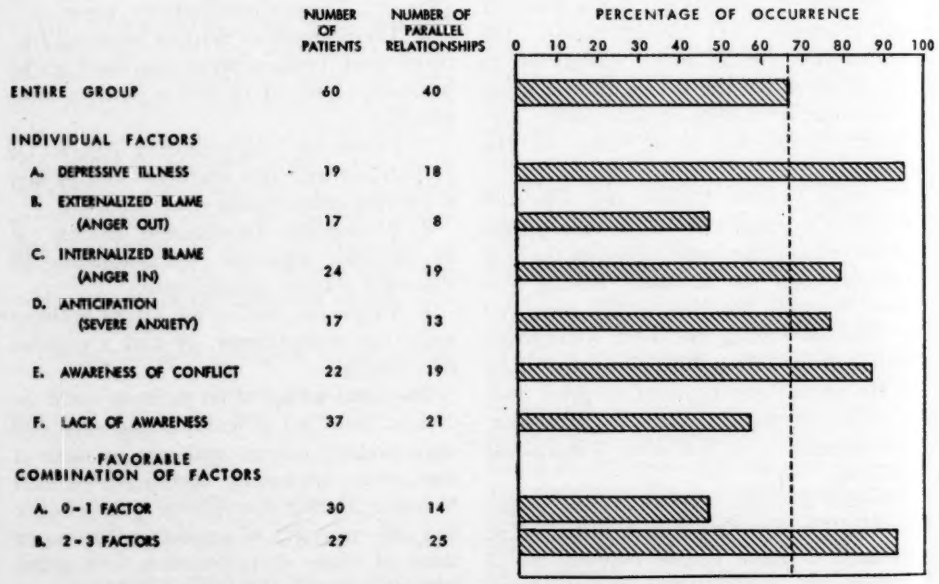
NUMBER OF PATIENTS
NUMBER OF PARALLEL RELATIONSHIPS
PERCENTAGE OF OCCURRENCE
0 10 20 30 40 50 60 70 80 90 100
ENTIRE GROUP 60 40
INDIVIDUAL FACTORS
A. DEPRESSIVE ILLNESS 19 18
B. EXTERNALIZED BLAME (ANGER OUT) 17 8
C. INTERNALIZED BLAME (ANGER IN) 24 19
D. ANTICIPATION (SEVERE ANXIETY) 17 13
E. AWARENESS OF CONFLICT 22 19
F. LACK OF AWARENESS 37 21
FAVORABLE COMBINATION OF FACTORS
A. 0-1 FACTOR 30 14
B. 2-3 FACTORS 27 25

FIG. 2. Occurrence of parallel emotion–norepinephrine relationship

included 33 patients in whom a parallel relationship was found in 18 instances. The group with two or more characteristics numbered 24 patients, of whom 22 had a parallel relationship.

Analysis of Factors Influencing the Parallel Emotion Rating–Norepinephrine Relationship. In similar fashion, certain characteristics appear to favor a parallel relationship between the Emotion Rating and norepinephrine levels (Fig. 2). These characteristics were:

1. Presence of Depressive Reaction in middle or late life. Nineteen patients had such a diagnosis; 18 of these patients showed a parallel relationship.

2. Personality—Anticipation. Of 17 patients with this characteristic, 13 had a parallel relationship.

3. Personality—Internalized Blame. Of 24 patients with this characteristic, 19 had a parallel relationship.

4. Awareness of Conflict. Of 22 patients with this characteristic, 21 had a parallel relationship.

Once more two subgroups of patients can be constructed. The group with one or none of the favorable characteristics included 30 patients, of whom only 14 had a parallel Emotion Rating–norepinephrine change. The group with two or more favorable characteristics numbers 27 patients, of whom 25 had a parallel Emotion Rating–norepinephrine relationship.

DISCUSSION

Clearly, the present report deals with an exploratory phase of the investigation of the relationship between emotions and amines. The biochemical procedures require further work (11, 14, 16), and the psychologic parameters need further clarification. Even at present, however, it may be seen that the findings suggest new ways in which the pattern of emotional–physiological relationships may be explored.

The findings indicate that, when certain characteristics of illness and personality are present, there is a close relationship between changes in amines and in emotions. As might be expected on the basis of previous studies (1, 5, 6, 7, 10, 13), this relationship is not a quantitative one but a relative one, which has its reliability within the individual. Depending on the specific type of characteristic found, and perhaps on the patient's level of activity (8, 17), it will be either the epinephrine or the norepinephrine that will be the more valuable indicator.

With the present group of patients, it may be seen that the emotion–amine relationship is reliable in only 60 to 70 per cent of patients. It seems important, however, that the application of the criteria described makes it possible to screen out from the total population a set of subgroups. In these subgroups, the reliability of this relationship is much greater. With further delineation, the parallel emotion–amine relationship may become a valuable clinical and investigative tool.

SUMMARY

In a study of 60 hospitalized psychiatric patients, it was found that circulating levels of epinephrine and norepinephrine tend to change in accordance with changes in an individual's emotional state. The presence or absence of certain descriptive and personality features indicates the frequency with which this parallel relationship will occur. Through an analysis of these factors, it seems possible to distinguish subgroups of the population in whom changes in epinephrine or norepinephrine, or both, tend to be reliable indicators of similar changes in the patient's emotional status.

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A COMPARATIVE STUDY OF CHLORPROMAZINE AND TRIFLUPROMAZINE IN THE MANAGEMENT OF THE CHRONIC HOSPITALIZED PSYCHOTIC PATIENT

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The present study is concerned with the relative effectiveness of trifluprom azine and chlorpromazine in the management of chronic hospitalized psychotic patients. Trifluprom azine was selected for study because it is a relatively new drug, and as yet little information is available as to its comparative status among the phenothiazines. It is one of a series of fluorinated phenothiazine compounds originally synthesized by Yale (3) of the Squibb Institute. Effectiveness is measured in terms of certain psychological dimensions observable in ward and interview behavior. Cognizance is also taken of side reactions and complications.

PROCEDURE

Thirty-five chronically ill psychotic female patients who had been hospitalized for several years in a state psychiatric hospital were selected for this study. The age range of the group was from 27 to 60, with a mean age of 45 years. All had been on maintenance dosages of chlorpromazine for several months due to various degrees of agitation, hyperactivity, excitement and emotional lability. Dosages ranged from 50 to 600 mgms. daily with a mean dosage of approximately 240 mgms.

These 35 patients served as an own–control population during a 20 week observation period subdivided into three distinct phases: (1) an original phase of four weeks in which chlorpromazine was continued at pre-study dosage levels so that initial baseline evaluations could be made; (2) a drug free-placebo interval (six weeks subdivided into two and four weeks, respectively) in which allowance was made for the subsidence of chlorpromazine action and the development of a longitudinal control on the patients' reactions to increased attention and to a change of medication; and (3) a final phase in which trifluprom azine was administered for a period of 10 weeks, at the end of which time final behavioral evaluations were made. Dosages in this phase were determined as closely as possible on an 0.5 proportional basis from original chlorpromazine levels, utilizing a standard 50 mgm. trifluprom azine tablet and setting an upper dosage limit of 200 mgms. The resulting mean dosage was approximately 120 mgms.

Throughout the study the patients were seen at two week intervals by a research team psychiatrist who was not informed of medication changes. Initial and final clinical evaluations were made by him on the basis of his continued observations. At the conclusion of each phase of the study, the patients were rated on an objective psychiatric rating scale (1), the *Multidimensional Scale for Rating Psychiatric Patients* (MSRPP), by a psychologist and ward personnel who, also, were not informed of the design of the study. Although the ward personnel were necessarily told when chlorpromazine was discontinued, they administered placebo and trifluprom azine medications on a code basis only. Complete

[1] Spring Grove Hospital, Catonsville, Maryland. Acknowledgements for assistance in this project are made to the following: E. R. Squibb & Sons, Division of the Olin-Mathison Chemical Corporation; Dr. Luis Lombardo, Assistant in Neurology, University Hospital, Baltimore, Maryland; Dr. Isadore Tuerk, Superintendent, Spring Grove State Hospital; Dr. Bruno Radauskas, Clinical Director, Spring Grove State Hospital; and to Friends of Psychiatric Research, Inc.

neurological evaluations were performed on each subject during chlorpromazine administration and again at the conclusion of the trifluprom azine period. In all those patients displaying extrapyramidal symptoms, neurological examinations were repeated seven to 14 days after termination of the medication.

RESULTS AND DISCUSSION

The following analysis of data is based on a total of 32 patients who were evaluated at the end of each treatment phase. Of the original 35 patients in the study, two were discontinued relatively early in trifluprom azine treatment because of the development of severe Parkinsonian reactions and one because of a *petit mal* convulsive seizure. Two patients developed moderately severe side reactions (Parkinsonism and diarrhea) toward the end of their trifluprom azine treatment periods but were included in the final evaluation. It is of interest to note here that, whereas only four Parkinsonian reactions had occurred as a result of original chlorpromazine treatment, 11 occurred as a result of trifluprom azine. After the cessation of both treatments, however, all Parkinsonian reactions quickly dissipated.

TABLE 1

The Mean Total Morbidity and Factor Scores on the MSRPP for the Three Treatment Phases — N = 32

Factors	Treatment Phases			
	Chlorpromazine	Placebo	Trifluprom azine	Norm*
A Retardation vs. excitement	14.03	14.59	14.47	17.00
B Compliance vs. resistiveness	6.22	6.53	5.53	4.00
C Paranoid projection	5.13	5.84	4.97	3.00
D Activity level	12.06	12.28	11.66	13.50
E Melancholy agitation	17.06	17.00	16.09	13.50
F Perceptual distortion	8.84	7.84	7.19	5.00
G Motor disturbance	11.81	12.19	11.53	9.00
H Submissiveness vs. belligerence	11.06	10.12	9.28	9.00†
I Withdrawal	9.28	9.19	9.91	15.00
J Depreciation vs expansiveness	8.25	8.12	8.44	9.00
K Conceptual distortion	12.03	12.59	10.88	7.00
Total Morbidity	35.06	35.16	30.06	0.00

* The raw score of an assumed normal individual.

† Although Lorr (1) considers Factor H to be bipolar, with scores below 11 as indicative of submissiveness, analyses of several items measuring this factor reveal truncated rather than bipolar distributions, with ranges from no evidence of overt hostility to extremely hostile behavior. Submissiveness here seems to be equated with a lack of overt hostility and as such is considered pathological. The present authors contend that a low score on this factor (with 9 as a base) is indicative of health rather than pathology.

In order to investigate the differential effects of the three treatment phases in the alleviation of psychopathology, the mean scores for each phase were computed for the total MSRPP morbidity score (a global measure of severity of symptoms) and for its 11 factor scores (measures of the degree of disturbance in 11 relatively independent areas of psychopathology). These results are presented in Table 1. As a standard for comparison, the "norm" score (the raw score of an assumed normal individual) is also presented. The magnitude of the deviation from this score may be considered to be directly proportional to the degree of pathology involved.

An examination of Table 1 shows that there are considerable mean variations in total morbidity and each factor from treatment to treatment. The most noteworthy immediately discernible mean change occurs in the total morbidity score of the MSRPP from the placebo (35.16) to trifluprom azine treatment phase (30.06), whereas no substantial change in total morbidity occurs from the chlorpromazine phase (35.06 to placebo (35.16). No general trend is observable in the directions of change between the factor means for the chlorpromazine and placebo phases, but in the trifluprom azine

phase there is a decrease in norm deviation in 9 of the 11 factors from the placebo phase and in 10 of the 11 factors from the initial chlorpromazine phase.

In order to test the significance of the mean differences noted above for the three treatment phases, the *t* test for matched samples was used. None of the mean differences between chlorpromazine and placebo treatments was found to be statistically significant; however, the mean differences between chlopromazine and trifluromazine treatments for total morbidity and for factors *B* (Compliance vs resistiveness), *E* (Melancholy agitation), *F* (Perceptional distortion), *H* (Submissiveness vs belligerence), and *K* (Conceptional distortion) were all statistically significant. The direction of change in each case was toward less pathology. Also, the mean differences between placebo and trifluromazine for total morbidity and factors *B* and *K* were significant, the direction of change again being toward less pathology. Substantiating results were found with the nonparametric "sign test" on all those significant factor differences noted with the *t* test, with the exception of factor *B* between chlorpromazine and trifluromazine treatment phases. Although positive relational tendencies were noted, the significant differences between total morbidity scores found with the *t* test were not substantiated with the sign test.

An analysis of the above results reveals that there has been at least a tendency toward change in gross behavior due to trifluromazine treatment from the original baseline evaluations made while the subjects were on chlorpromazine. The change seems to be of a general nature, with a certain amount of alleviation of symptomatology appearing in five of 11 dimensions of psychopathology. There apears to be less evidence of resistiveness and overt hostility, less melancholy agitation, and less perceptual and thinking disorder. Alleviation of symptomatology is especially apparent in the areas of resistiveness and thinking disorders, since in these areas the direction of change in the trifluromazine phase was opposite to that effected with placebo.

An analysis of individual patient morbidity score changes also yields noteworthy results. Utilizing information from a statistical "control group" of psychotic patients on whom test-retest MSRPP data were already available, the method of Payne and Jones (2) was employed to determine the significance of change during the three treatment phases for each of the 32 subjects. On the basis of these data a 21 point differential in scores was considered well over 1.98 times the standard error of measurement for all between–test periods, and would therefore be indicative of statistically significant changes. The following groups were thereby identified: (1) Twenty-four patients who maintained the same status over the three treatment phases; (2) Four patients who became worse on placebo, three of whom improved with subsequent trifluromazine treatment; and (3) Four patients who showed a better response to trifluromazine than to chlorpromazine. Data regarding patient change obtained from the clinical evaluations of the research psychiatrist were in essential agreement with the findings presented here.

SUMMARY

The behavior of 32 chronic hospitalized female psychotic patients, who had been on maintenance dosages of chlorpromazine for several months, was observed and objectively rated on the MSRPP during three successive treatment phases: chlorpromazine, placebo, and trifluromazine. Results indicated that at approximately one–half the dosage level, trifluromazine not only served as an equally effective maintenance function as chlorpromazine, but also produced a certain amount of symptom alleviation over and above that achieved by the original chlorpromazine and subsequent placebo medications.

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THE PATHOPHYSIOLOGY OF GRAND MAL SEIZURES GENERALIZED FROM THE START

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IN COLLABORATION WITH

R. NAQUET, M.D. AND M. FISCHER-WILLIAMS, M.R.C.P. Ed.[2]

In this article we shall attempt to present a coherent, unifying conception of the pathophysiology of grand mal seizures generalised from the start.

THE ORIGIN, NATURE AND PROPAGATION OF NERVOUS ACTIVITY RESPONSIBLE FOR GENERALISED GRAND MAL SEIZURES

If we admit that the clinical and E.E.G. manifestations of generalised grand mal epilepsy are not necessarily linked and that the former are of greater "medical" interest, we should first of all try to explain these clinical phenomena and afterwards search for the factors that link them to the hypersynchronous discharges which usually accompany them. We shall therefore look around for experimental conditions which provoke transient generalised convulsions, whether or not they are reputed to be "epileptic" and we shall try to analyse their precise pathophysiological mechanism. In the present state of knowledge, there are five convulsive conditions which can throw light on the problem. These include convulsions precipitated by cerebral anoxia, strychnine, metrazol, consecutive injections of metrazol and strychnine, and the combination of anoxia and strychnine.

1. Convulsions with loss of consciousness preceded or followed by one or two muscular jerks and characterised by an intense contraction in opisthotonus are precipitated in man and in animals by all forms of *cerebral anoxia* (anoxic anoxia from insufficient partial pressure of oxygen; toxic anoxia after injection of sodium cyanide; ischaemic anoxia due to cardiac arrest and fall in blood pressure, etc.). These phenomena have been studied electrophysiologically in the animal by Noell and Dombrowsky (35), Ward (44), Ward and Wheatley (45) and Ajmone-Marsan and Fuortes (3). The concordant results of these authors may be summarised as follows:

During acute anoxia depression of electrical activity extends progressively from the telencephalon to the diencephalon and then to the mesencephalon and the metencephalon, during which time the most caudal structures, notably the reticular formation (in the medulla and pons) and the spinal cord develop or continue to show considerable electrical activity.

Anoxic convulsions are no longer seen after the bulbar part of the reticular formation has been destroyed by diathermy (44).

One must therefore conclude that anoxic seizures depend on the activity of the caudal reticular formation when it is no longer under the control of the higher nervous structures (see Figure 1).

2. Convulsions without loss of consciousness preceded and followed by clonic jerks and characterised by intense contraction in opisthotonus are provoked in man and animals by the administration of *strychnine* or other poisons (nitrogen mustards, dichloro-diphenyltrichloro-ethane). These convulsions have been studied from the electrophysiological point of view in the animal by Bremer (5), Markham et al. (29), Ruf (39), Marossero and Garrone (30), Terzuolo (43), Bremer and Bonnet (6) and

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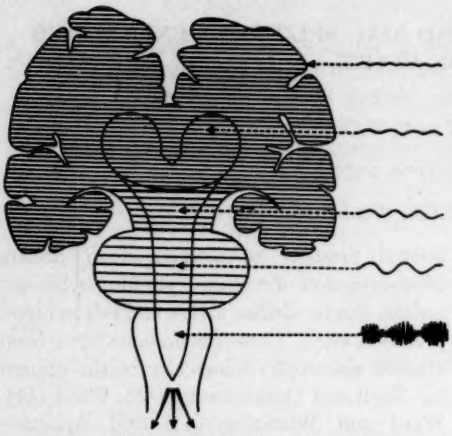


FIG. 1. *Diagram illustrating the mechanism of anoxic convulsions.* The degree of functional depression of neuronal structures produced by anoxia is proportional to the density of the horizontal shading: it is maximal in the telencephalon and diencephalon; it diminishes in the mesencephalon; it is barely perceptible in the metencephalon and absent in the myelencephalon.

The caudal reticular formation contained in the rhombencephalon is "liberated" (for its electrical activity remains normal while that of the higher nervous structures is depressed), and the convulsions may thus be attributed to its tonicogenic action on the motor pathways.

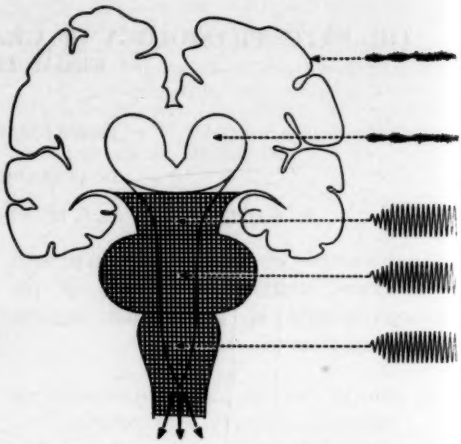


FIG. 2. *Diagram illustrating the mechanism of strychnine convulsions.* Strychnine provokes a hypersynchronous convulsant discharge of fairly high frequency localized to the rhombencephalon and mesencephalon. The electrical activity of the higher nervous structures although desynchronised remains normal.

It is the activation of the reticular formation under the effect of local hypersynchronous discharge which provokes the convulsions.

Johnson (23). These studies give the following remarkably similar results:

Strychnine convulsions are accompanied by a hypersynchronous discharge extending to the whole of the reticular formation of the spinal cord and the brain–stem but excluding that of the thalamus; in particular this excludes the intralaminar and midline nuclei whose stimulation provokes the recruiting response.

This discharge of the reticular formation secondarily extends to the cerebellum. Bremer considers that the reticular formation is the site of the autorhythmic tetanic activity and he has shown that the discharges recorded from the cerebellar cortex only represent a reactivity to those coming from the reticular formation. This reticular discharge also extends to the motor neurones of the spinal cord and their hypersynchronous activity is directly responsible for the convulsions. On the contrary, it does not extend to the cerebral cortex which reacts by desynchronisation.

The neuronal reactivity of this desynchronised cortex is normal or diminished but never augmented (46). Chang (7) also found that strychnine decreased the excitability of the cortical neurones.

One must therefore conclude that strychnine convulsions result in a discharge of the caudal part of the reticular formation without any participation of the telencephalon or even of the thalamus (Figure 2).

3. Intense tonic contraction with loss of consciousness preceded by a few isolated clonic jerks and followed by a phase of rhythmical clonic convulsions are provoked by various *analeptics*, notably by thujone, by beta–ethyl–beta–methyl–glutarimide (Megimide) and by penta–methylene–tetrazol (*Metrazol*). An electrophysiological study of these convulsions in animals has been made by Gastaut et al. (15) Ajmone–Marsan and Marossero (2) and

Starzl et al. (41) with the following results:

During these convulsions a hypersynchronous discharge replaces all normal activity in the telencephalon and diencephalon, clearly predominating over the cortex and in the thalamus. This discharge is less marked in the midbrain and the rhombencephalon where it does not replace local activity and where normal or increased spontaneous activity continues.

The responsiveness of the cortex to electrical stimulation (as shown by the threshold and sensitivity of the cortico–spinal neurones) remains unchanged even when metrazol is used in quantities sufficiently large to induce "spontaneous" convulsive discharges (46). Assessing neuronal excitability by the chronaxie method, Chauchard et al. (8) demonstrated that sub–convulsant doses of metrazol depressed the excitability of the cortex while increasing that of the brain–stem and spinal cord (an action comparable to that of anoxia).

One must therefore conclude that the mechanism of convulsions induced by metrazol is analogous to that of seizures precipitated by anoxia, that is to say a "liberation" of the activity of the caudal reticular formation while the overlying nervous structures are functionally excluded (Figure 3).

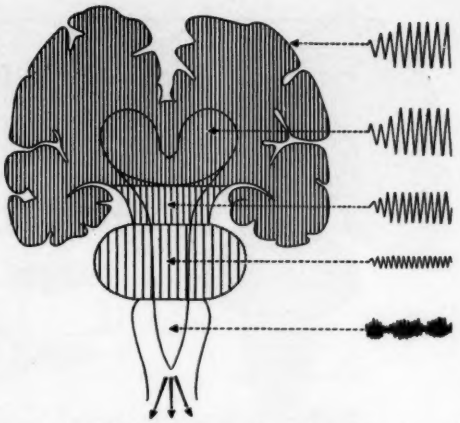


FIG. 3. *Diagram illustrating the mechanism of metrazol convulsions.* The intensity of the hypersynchronous discharge provoked by metrazol is proportional to the density of the vertical shading; it is maximal in the telencephalon and diencephalon; it diminishes in the mesencephalon and metencephalon; it is barely perceptible in the myelencephalon.

Since this discharge involves the rostral reticular formation and parts of the brain which are antagonistic to the caudal reticular formation, it leads to a "liberation" of the caudal reticular formation which may be responsible for the convulsions. One cannot, however, exclude direct activation of the caudal reticular formation by metrazol, despite the fact that it preserves normal electrical activity and does not show a hypersynchronous discharge.

4. Convulsions have been provoked in animals by the combined administration of metrazol and strychnine (1, 2). These convulsions are expressed by:

a A hypersynchronous discharge in the telencephalon and the diencephalon of metrazol type and by a discharge of the reticular formation in the mesen–rhombencephalon of strychnine type; these discharges develop each on their own and are completely independent.

b A tonic spasm of purely strychnine type develops with no resemblance to metrazol convulsions and not bearing any relation to the discharge over the cortex induced by metrazol.

One must therefore conclude that these seizures result from a discharge of strychnine type in the caudal reticular formation without the participation of the telencephalon and diencephalon activated by the metrazol (Figure 4).

5. Convulsions have been provoked in animals by a combination of asphyxic anoxia and strychnine injection (17). These convulsions (Figures 5, 6, 7) are expressed by:

a An anoxic depression of electrical activity extending progressively from the telencephalon to the diencephalon, the mesencephalon and finally to the metencephalon;

b A hypersynchronous strychnine discharge of the brainstem reticular formation increased by anoxia;

c A tonic spasm of anoxic–strychnine

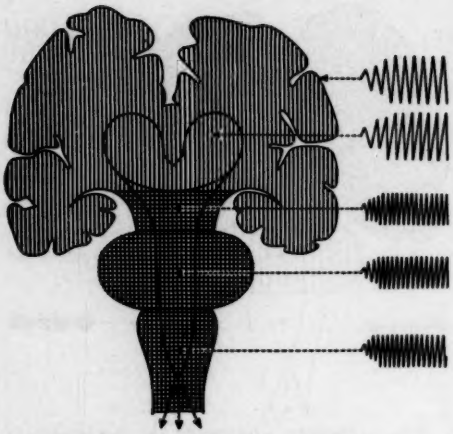


FIG. 4. *Diagram illustrating the mechanism of convulsions provoked by combined injections of metrazol and strychnine.* Metrazol provokes a hypersynchronous discharge in the telencephalon and diencephalon (represented by the vertical shading), while strychnine provokes a hypersynchronous discharge of higher frequency in the mesencephalon and rhombencephalon.

It is this direct activation of the reticular formation under the effect of the rhombencephalic discharge which may be responsible for the resultant strychnine convulsions.

type increasing during the anoxic reinforcement of the reticular discharge.

One must therefore conclude that these seizures result from a reinforced discharge in the caudal reticular formation when no longer under the control of the higher nervous structures.

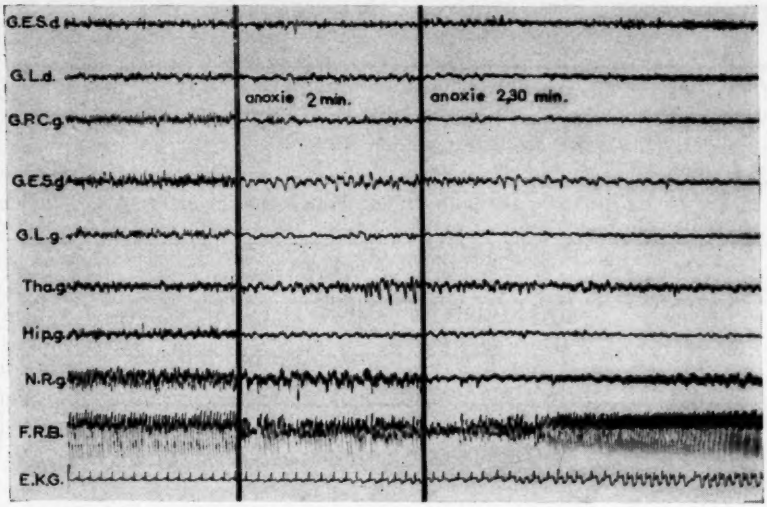
Comparing these different mechanisms, it appears that generalised tonic spasm and clonic convulsions depend exclusively on the caudal reticular formation which acts on the effector neurones, and particularly on the motor neurones of the spinal cord, by means of the various reticulospinal and vestibulo–spinal pathways and projections[3].

[3] These pathways, like the structures from which they originate, are capable of inhibiting as well as reinforcing muscle tone: the medial part of the caudal reticular formation is inhibitory, whereas all the rest of the reticular formation and the vestibular formation is facilitatory (28). It may therefore be supposed that the inhibiting action is less efficacious than the facilitating one and that it is entirely masked when the reticular formation discharges as a whole. These views have been largely illustrated by the classical neurophysiologists of the Sherrington school, for when the whole reticular system, inhibitory as well as facilitatory, is "liberated", a state of decerebrate rigidity results and not one of hypotonia.

The mode of activation of this caudal reticular formation varies, however, for it may represent a positive phenomenon, a hypersynchronous neuronal discharge, or a negative phenomenon, a "liberation" by depression or functional exclusion of the overlying structures.

The loss of consciousness accompanying the convulsions would seem to depend exclusively on the rostral, thalamic reticular formation and the cortex. In man, anoxic syncopal seizures, metrazol seizures and all other generalised epileptic seizures are accompanied by unconsciousness. This is determined by functional exclusion of the thalamo–cortical system, which is either deprived of oxygen or invaded by a hypersynchronous discharge. Conversely, strychnine convulsions respect the thalamo–cortical system and are characterised by preservation of consciousness; tetanic seizures and tonic cerebellar fits are probably based on the same mechanism.

We must now attempt to apply these hypotheses to the interpretation of the convulsions of grand mal epilepsy, believing that seizures provoked by metrazol are the only ones which faithfully reproduce spontaneous epilepsy in man with its hypersynchronous cortical discharge and its well defined tonic and clonic phases. A grand mal seizure seems to depend on a thalamic discharge which involves both the non–specific reticular structures and the cortex in what may be considered a generalised recruiting response transmitted along the diffuse cortical projection pathways. As the system responsible for the recruiting response is also responsible for generalised epileptic discharges (19, 15, 36) and as it also seems implicated in the production of bursts of barbituric "sleep" (31, 21), one is tempted to compare the hypersynchronous



FIGURES 5, 6, 7. *E.E.G. recording in the cat showing the effect at different levels of strychnine and anoxia.*

G.E.S. d.\
G.E.S. g./ = Gyrus ecto-sylvian, right and left.

G.L. d.\
G.L. g./ = Gyrus lateralis, right and left.

G.P.C. g. = Gyrus pre-cruciate, left.
Tha. g. = Left thalamus.
Hip. g. = Left hippocampus.
N.R. g. = Left nucleus ruber.
F.R.B. = Bulbar reticular formation.
E.K.G. = Electrocardiogram.

FIG. 5. An initial injection of strychnine was given. The discharge provoked in the bulbar reticular formation (F.R.B.) is of very large amplitude. In the reticular formation of the mesencephalon at the level of the red nucleus (N.R.) it is of much smaller amplitude. Note that the discharge is not transmitted to the hippocampus (Hip.), nor to the thalamus (Tha.), nor to the cerebral cortex which, however, are all desynchronised.

Following asphyxic anoxia of 2 minutes' duration, the discharge in the reticular formation diminishes in intensity and the thalamo-cortical desynchronisation disappears. Slow waves appear in the thalamus and cortex (left ecto-sylvian gyrus). After 2½ minutes of anoxia, a sudden marked reinforcement of the strychnine discharge in the reticular formation appears which leads immediately to extreme desynchronisation in the thalamus and cortex.

discharge of generalised epilepsy to a kind of paroxysmal "sleep" localized to the thalamo-cortical system and causing functional exclusion of this system. This functional elimination may be the direct cause of the loss of consciousness and by liberating the underlying reticular structures it may be the indirect cause of the convulsions.

Given the antagonism which exists between the thalamic part of the reticular formation and the mesencephalo-rhombencephalic part (22, 26) one may postulate that momentary depression of the caudal reticular system, under certain circumstances, favours a thalamo-cortical discharge which may indirectly cause the seizure; this may explain the part that sleep plays in inducing generalised seizures.

Finally, given the independence of these two parts of the reticular formation, one may suppose that a factor which can precipitate thalamo-cortical hypersynchrony can equally (and *independently*) precipitate hypersynchrony of the reticular formation. In this way a double reticular discharge is realised of which one, the thalamic, may be

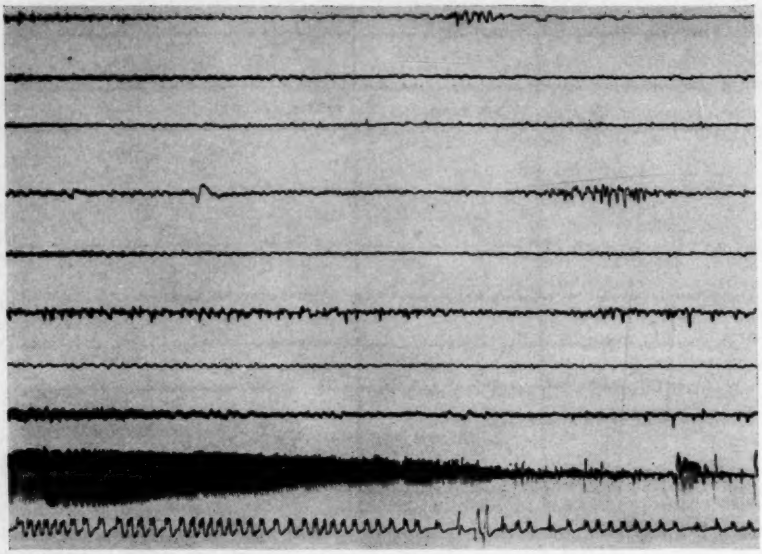


FIG. 6. The reinforcement of the discharge of the bulbar reticular formation reaches a maximum and then progressively diminishes, while at the same time the thalamo–cortical desynchronisation lessens and is replaced by slow waves.

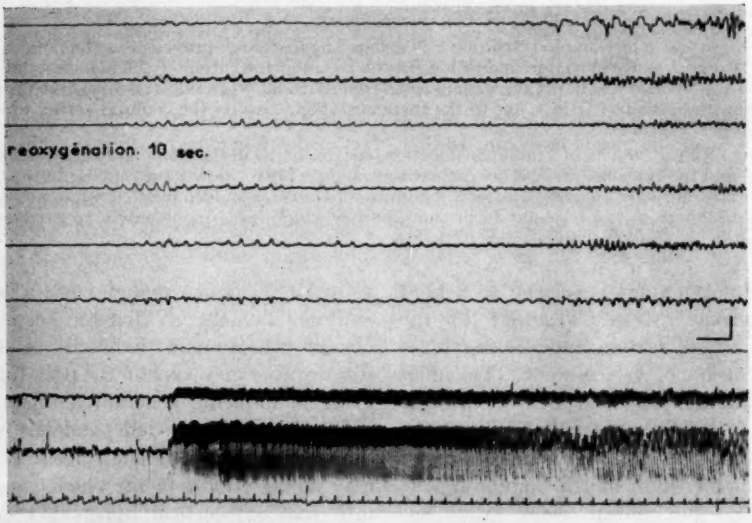


FIG. 7. Reoxygenation is begun while there is complete electrical silence in the thalamus and cortex in contrast to the persistence of clear–cut strychnine activity in the bulbar reticular formation. After 10 seconds of re–oxygenation a few slow waves appear in the thalamus and cortex and an intense reinforcement of the strychnine discharge in the reticular formation.

responsible for the cortical manifestations of the seizure, and the other, the mesencephalo-rhombencephalic, for its peripheral manifestations.

One comes therefore to the following conclusions:

Generalised grand mal epilepsy is related to a sub-cortical mechanism corresponding first to a paroxysmal discharge of the thalamic reticular system transmitted to the cortex by the diffuse thalamo-cortical projection pathways, which explains the loss of consciousness.

This discharge entails the functional exclusion of the thalamo-cortical formations and thus liberates "normal" or reinforced activity of the caudal reticular system; this release allows the tonicogenic reticulo-spinal system which is the basis for the peripheral convulsions to come into play.

CAUSES OF THE DISCHARGES OF THE THALAMIC AND MESENCEPHALO-RHOMBENCEPHALIC PARTS OF THE RETICULAR FORMATION RESPONSIBLE FOR GRAND MAL EPILEPSY

A focal or diffuse irritative lesion of the reticular formation has seldom been found as a cause of generalised seizures. Nevertheless characteristic lesions in these regions have been noted in certain familial degenerative epilepsies of the Unverricht-Lundborg type.

Since in the majority of cases of grand mal seizures generalised from the start and in all those of experimental generalised epilepsy there are no demonstrable lesions of the reticular formation, the discharge responsible for these seizures no doubt depends on functional abnormality of the reticular neurones. This functional abnormality may depend on the unique anatomical arrangement found in the reticular formation; numerous afferent collaterals (42) hailing from all different parts of the peripheral and central nervous system (from the sensory lemnisci, the cortex, sub-cortical regions and cerebellum) all converge towards common reticular elements to set up phenomena of summation (33). With this spatio-temporal summation on neighbouring neurones, and provided that these are in a hyperexcitable state (either because of constitutional factors or acquired pathology), the normal inflow of nerve impulses in the reticular formation may cause sufficiently synchronous cellular potentials for an effective electrical stimulus to arise. This stimulus will then entail a discharge of the surrounding hyperexcitable cell bodies by direct electrical spread and independently of any process of synaptic transmission (ephaptic phenomenon). Once this process has been started, the discharge spreads like an avalanche throughout the reticular formation with a speed of the same order as that of the nerve impulse. This theory (13) is only a particular application of the general hypothesis suggested by Moruzzi (32): "A normal neurone, by the simple fact of being subjected to a bombardment of nervous activity at high frequency, can enter into a convulsive state".... "It is the ordinary inflow of nerve impulses which determines the fact that a neurone passes from normal activity to an epileptic state".... "Any neurone may become epileptic, simply through the effect of bombardment of nervous activity".

In an unstable system (such as an organisation of hyperexcitable neurones) it is usually an external force that upsets the equilibrium. It is not surprising therefore that a volley of impulses, converging on a centre whose state of tension is abnormally raised, supplies the energy necessary to build up the hypersynchronous discharge. This logical conception was indeed held by the early workers in epilepsy who, from Hall (18) onwards, elaborated the bulbar reflex theory of generalised epilepsy and believed that it depended on a "discharge produced in a reflex way in the region of reticular substance of the pons and medulla...." (34) under the effect of "an exalted sensi-

bility and excitability of the medulla oblongata" (40). One should not conclude, however, that generalised epilepsy is merely a reflex phenomenon and speak of "reflex epilepsy"; this unphysiological term is not applicable today to any variety of epilepsy.

The hyperexcitable state of the neurones, which is a necessary factor to allow the discharge of the reticular formation may depend on the existence of an "irritative" cerebral lesion, lying in the neighbourhood or even at a distance from the brain stem. Johnson and Walker (24), and Kopeloff et al. (27) have shown that epileptogenic lesions localised in one hemisphere are always accompanied by a diffuse hyperexcitable state of the neurones manifested by a general lowering of the convulsant threshold. It may equally depend on a functional factor as yet undetermined, a "humoral" or "cerebral" factor acting at the level of the synapses, the axones or the cell bodies, and responsible for an "epileptic predisposition" found both in man and in animal. This epileptic predisposition and the hyperexcitable state of the neurones may be quantitatively appreciated by determining the convulsant threshold with combined metrazol and photic stimulation (13). By this method it has been shown that the threshold is low in patients suffering from seizures generalised from the start and in those whose attacks of partial epilepsy pass very easily into secondary generalization.

DURATION AND TERMINATION OF THE DISCHARGE

The duration and termination of a grand mal seizure depend on a dual mechanism: a positive process of neuronal exhaustion and a negative process of inhibition.

1. *The former mechanism, the progressive fatigue and final exhaustion of the neurones*, which may bring about the cessation of the seizure is attributed either to the accumulation of acidic metabolites or to the fact that the reserves necessary for cellular functioning have been used up, or to both processes at once. The first hypothesis ("Ermüdung" in the sense in which Verworn used it in 1900), has not been satisfactorily demonstrated, for, if the pH of the motor cortex shows a tendency towards acidity during the fatigue stage of a faradic seizure (11), it evolves on the contrary towards alkaline values at the end of a seizure of generalised epilepsy induced by metrazol (20).

On the other hand, the second hypothesis ("Erschöpfung" in the sense of Verworn) has been largely demonstrated. Ruf (39) prolonged a metrazol seizure for thirty minutes by administering oxygen to an experimental animal and for one hour by adding adrenaline to the oxygen. Davies and Remond (9) demonstrated the existence of relative asphyxia in the cerebral cortex during convulsive activity by a method of microelectrodes sensitive to oxygen.

Neuronal exhaustion whatever may be its particular nature seems to play a part in the clinical and electrical manifestations of grand mal seizures. This may be argued on the following grounds:

At the beginning of a grand mal seizure the E.E.G. discharge does not diminish in frequency because initially the neurones are indefatigable. This however is only apparent if hypersynchrony is still incomplete at this moment, as Rosenbleuth and Cannon (38) believe, and if different cortical elements are responsible for successive convulsive waves. It may, however, be real, if at the onset of the seizure the neurones enjoy oxygen pressures distinctly higher than those which may cause the seizure to terminate. In addition, the neurones may be so hyperexcitable at the beginning of a seizure that they are able to discharge with very low oxygen pressures. Whatever the case may be, the E.E.G. discharge of sustained frequency characteristic of the beginning of a grand mal seizure corresponds to the discharge of the peripheral motor units. This is equally sustained but of much higher

frequency and it produces the absolute tetanus at the beginning of the tonic phase.

Once the seizure has lasted a few seconds the E.E.G. discharge slows progressively which indicates that the functional refractory period of the thalamo–cortical neurones is increasing in length as the neurones fatigue. This process of increasing fatigue also affects the reticulo–spinal neurones and the complete tetanus is thereby converted into an incomplete tetanus, and the last part of the tonic phase assumes a vibratory character.

At a certain point of fatigue, the functional refractory period has become so lengthened that the discharge is interrupted briefly. This, the first period of extinction, is translated on the E.E.G. as an interval of electrical silence and at the periphery as relaxation of the tonic spasm introducing the first clonus. This momentary rest permits partial recovery of energy, which leads to a recurrence of the discharge (first group of spikes) and of the muscular contraction (first clonic jerk). A further period of extinction, longer than the first, then follows, and it is in turn followed up by another discharge. The cycle continues in this way throughout the whole of the clonic phase until total exhaustion, which is characterised by lasting extinction of both electrical activity and convulsions[4].

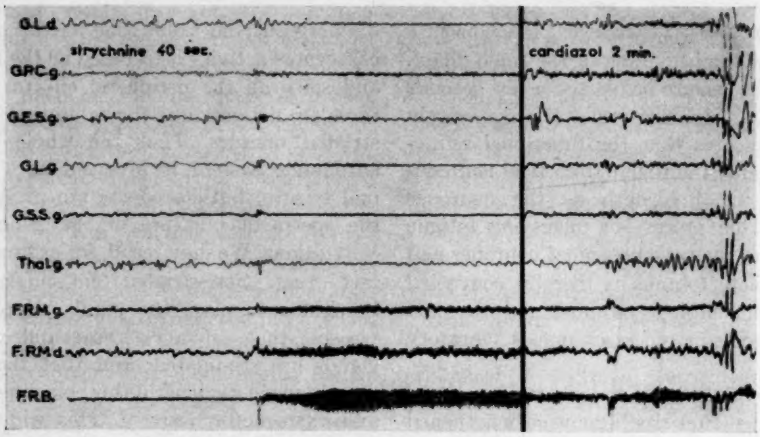
Post–ictal recovery is slow; it is manifested electrically by the appearance of abnormal slow rhythms, first delta, then theta; and from the clinical point of view by coma and an episode of gradually clearing confusion.

This simplified picture of a grand mal seizure might lead one to believe that the seizure is confined to a cortical discharge recorded on the E.E.G. and the convulsions observed clinically. This is far from being the case, since all the cerebral neurones discharge at the same time as the cortical cells whose activity is recorded on the E.E.G. and since all the peripheral effector structures are activated at the same time as the striated muscles. Thus the whole of the autonomic system is involved in a grand mal seizure, but its effects are masked by the spectacular nature of the generalised convulsions. We may recall, for example, the fact that non–striated musculature is brought into play, the pupils, nipple and viscera; that salivary, sweat and vaginal glands are stimulated; and that there are alterations in cardiac rhythm, blood pressure and vaso–motor activity. This widespread effect is easily understood because the diffuse projections which radiate out from the brain–stem reticular formation go not only to the cortex but to all the grey matter of the brain. In addition the reticulo–spinal pathways link up with the autonomic pre–ganglionic centers in the brain–stem and spinal cord just as they do with the somato–motor centres in these same regions.

2. *The second mechanism is one of a process of active inhibition.* It may be supposed that the rhythmical interruption of a grand mal seizure depends not only on neuronal exhaustion, but also implies that a phenomenon of intermittent inhibition comes into play and develops in "suppressor" structures.

Expounding this theory in 1949, Jung suggested that the inhibitory structure was the caudate nucleus because it was from there that he recorded large, regular, slow waves, coinciding with the periods of relaxation in the clonic phase and interposed between the fast rhythms recovered from the cortex and the thalamus. This hypothesis agrees well with Dusser de Barenne et al. (10) who believed that inhibitory neurones were situated in the caudate nucleus and acted upon by the various cortical "suppressor" zones, and that they were effective through the thalamus and a cortico–caudo–thalamo–cortical circuit. The close relationship between the theories of Jung and of

[4] Fatigue, however, is probably only responsible for the progressive slowing of the discharge and not for the rhythmical interruption, which depends exclusively on the inhibitory mechanism described later.



FIGURES 8, 9, 10, 11. *E.E.G. recording in the cat showing the effect at different levels of strychnine and metrazol (cardiazol).*

Abbreviations as in figures 5, 6, 7, but in addition:
G.S.S. g. = Gyrus supra-sylvius, left.
F.R.M. g.\
F.R.M. d./ = Mesencephalic reticular formation, left and right.

FIG. 8. Forty seconds after an injection of strychnine a very marked discharge develops in the bulbar reticular formation (F.R.B.) and also in that of the mesencephalon (F.R.M. g. and F.R.M. d.). Note that the discharge is not transmitted to the thalamus (Thal.) nor to the cortex, which however are entirely desynchronised. Two minutes after an injection of metrazol (cardiazol) the first discharges appear in the thalamus and cortex; they spread right to the mesencephalic reticular formation, but do not involve the bulbar reticular formation.

Dusser de Barenne is further demonstrated by the fact that Gastaut and Hunter (15) and Starzl et al. (41) recovered these same slow waves from the intra-laminar and mid-line nuclei of the thalamus.

From these experimental results one may postulate the existence of a thalamo-caudate inhibitory system "branched off in a side-chain" from the non-specific thalamo-cortical projection fibres. This system may actively inhibit the reticular formation of the thalamus as well as that of the caudal brain-stem, and thus prevent the discharge of cortical spikes at the same time as the peripheral contraction.

Recently Gastaut, Naquet and Fischer-Williams (16) have verified this hypothesis by demonstrating the inhibitory action on the caudal reticular formation of the slow waves recorded in the thalamus during generalised seizures. They observed that the slow waves provoked in the thalamus by an injection of metrazol suppressed the discharge which a previous injection of strychnine had provoked in the mesen- and rhombencephalon (Figures 8, 9, 10, 11). The discharge due to the strychnine reappeared in the intervals between the slow thalamic waves (Figures 10, 11). In other words, the thalamo-cortical discharge of grand mal responsible for cortical spikes and for "release" of the reticular formation (with its consequent tonic phase) may be equally responsible for putting into action the inhibitory system whose slow waves rhythmically interrupt the discharge of spikes. The slow wave represents not a convulsion wave but a state of actual neuronal depression linked to a phenomenon of active inhibition (the "braking" wave of Jung, the phylactic wave of Grey Walter, the inhibitory wave of Gastaut).

This theory explains the absence of the clonic phase in anoxic and strychnine seizures, for in these the telencephalon in which lies the inhibitory system is function-

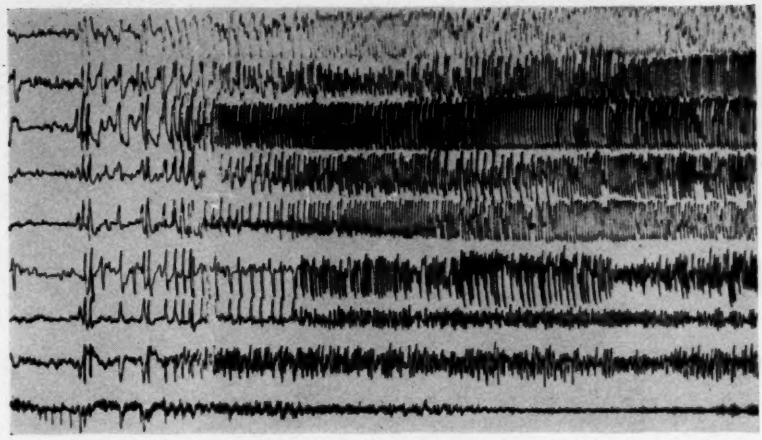


FIG. 9. The discharges in the thalamo–cortical system and those in the bulbar reticular formation continue to be independent. A burst of spikes occurs in the bulbar reticular formation without any thalamo–cortical expression. A generalized thalamo–cortical discharge then appears (beginning in the left ecto–sylvian gyrus) without counterpart expression in the bulbar reticular formation.

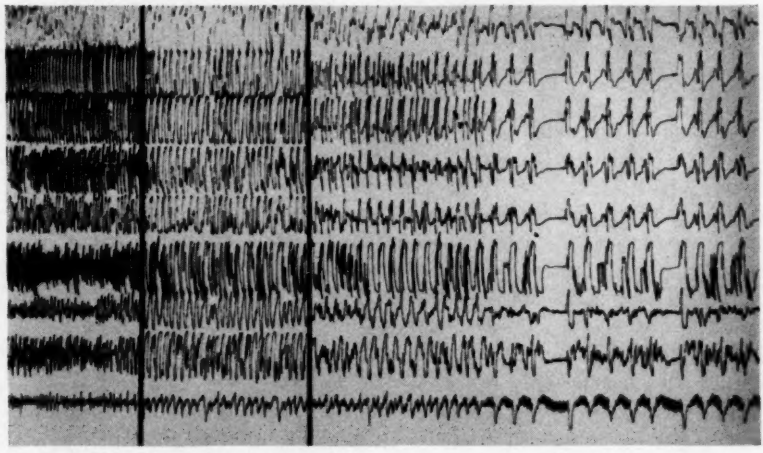


FIG. 10. Three different stages in the generalised seizure due to metrazol. They show the progressive importance of the slow waves developed in the thalamus and their propagation right into the bulbar reticular formation where they inhibit the local strychnine discharge. This inhibitory action becomes more apparent as the frequency of the slow waves diminishes which allows the strychnine rhythm to be unmasked and to reappear in the intervals of the slow waves.

ally depressed and not actively brought into play.

It also explains why the seizures induced by metrazol or other analeptics in the diencephalic, mesencephalic or rhombencephalic animal are purely tonic. There may be a few clonic jerks depending on brief discharges of the reticular formation, but there is never a clonic phase since this represents the rhythmic inhibition of the tonic spasm, and this inhibition depends on the action of telencephalic structures which are (by definition) absent in these animals. Finally, it explains the erroneous interpretation given by Ziehen (47) and Bechterew (4) who basing their opinions on the results of

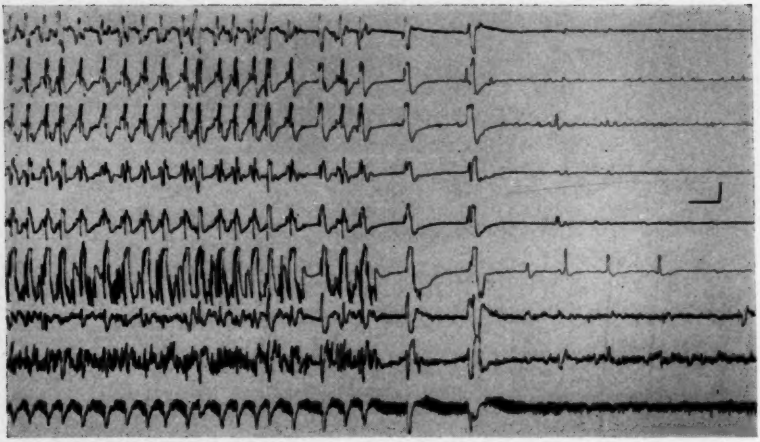


FIG. 11. End of the generalized thalamo–cortical discharge. The inhibitory action of the slow waves in the thalamus on the reticular formation is still more manifest, for the strychnine discharge reappears in the intervals between the transmitted slow waves. Note that the strychnine discharge continues in the reticular formation despite the complete post–ictal extinction in the thalamo–cortical system.

decortication related the tonic component in grand mal to activity in brain–stem structures and the clonic component to the cerebral cortex.

One may therefore conclude that neuronal fatigue and exhaustion are responsible for both the progressive slowing of the cortical discharge in grand mal and the lessening of the tetanic muscular spasm during the tonic phase. The thalamo–caudate system of active inhibition is responsible for the periods of relaxation in the *clonic* phase with the concomitant slow "inhibitory" waves seen on the E.E.G. and for the episodes of cortical electrical silence.

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HYPERERIDISM AND ATTEMPTED SUICIDE IN CHINESE

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Whether or not suicidal acts end in death depends on a combination of factors; maturity in age, masculinity, the availability and use of active and lethal methods, precipitating causes arising from economic pressure and disease—all these are known to increase the likelihood of a fatal outcome. There are also the factors of genuineness of intent and the capacity to execute the act efficiently, but these are psychological ingredients rather more difficult to assess. In this paper an examination is made of them in relation to the state of hypereridism that Lindemann (16) has described as underlying suicidal behaviour. For reasons which will be apparent this subject can be usefully studied among Chinese women living in a more traditional setting.

THE HYPERERIDIC STATE

Hypereridism is defined by Lindemann, who coined the term, as a morbid state of hostile tension, arising from a series of repeated provocations, which might result in "explosive behaviour rather more aggressive than is appropriate to a given set of circumstances". With the increasing employment of defense mechanisms inhibiting the expression of aggression the subject becomes depressed or obsessional and may eventually develop severe agitated depression "which is the core of the condition". Suicidal acts then become more frequent and more likely to be successful. The suggestion is therefore that in simple hypereridism uncomplicated by depression the wish to kill oneself is not seriously present. While the probability of lack of success in simple hypereridism is stated, Lindemann does not bring out the fact that it is largely the very impulsiveness and explosiveness in such a condition that mars the suicidal attempt.

Lindemann's concept of hypereridism is based on the Freudian theory of Thanatos, an aggressive instinct *per se*, turning inwards because of the strength of the super-ego, the ego-ideal and external reality. In his earlier work (before 1919), Freud had postulated that aggression arose from frustration, and did not accept an independent instinct of aggression. This problem is not one requiring solution by means other than that essentially of definition; but it may be pointed out that the postulate that frustration produces aggression has led to instructive experimental work by Dollard *et al.* (7), which gives it partial confirmation. Studies of this kind on the effects of frustration provide experimental approaches to the understanding of hypereridism. Miller (18) and Rosenzweig (21) have also demonstrated that under experimental conditions frustration could lead to intropunitive responses during which the subject admitted and even exaggerated his own responsibility for failure. The latter further showed that among neurotics this response was commoner in depressed and anxious patients than in hysterics. Maier (17) has emphasized that frustration-instigated behaviour lacked a goal, the function of which is to reduce tension in the subject; consequently such behaviour is impulsive and maladaptive, although it may become fixed and stereotyped with repetition. Barker *et al.* (1) have demonstrated that frustration could lead also to regressive behaviour. It it fair to conclude that aggression is frequently, but not necessarily, produced by frustration (see Klineberg (13)).

Conceived at a level closer to the clinical, hypereridism is a condition far from rare.

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Lindemann states in a personal communication that he does not regard it as "a disease". However, it is clinically recognizable in non-neurotic persons who appear unusually aggressive, whether due to a strong biological drive or a weak power of self control, or both, and also in those who, again non–neurotic, are immature and subjected to continuous interpersonal domination and conflict. The symptoms manifested are irritability, bad humour, ambivalent attitudes of hate and guilt, of envy, jealousy and contrition, and impulsive acts of aggression directed outwards or within. Examination of a series of cases of suicide will as a rule reveal examples of this condition.

STUDY IN HONG KONG

In a study of suicide in Hong Kong based on 263 recent cases of consummated suicide and 894 cases of attempted suicide (details of which will appear elsewhere*) the following observations were made. 1. In attempted, but not consummated suicide, young women (but not men) were significantly more numerous than might be expected from the age and sex distribution of the population. 2. Interpersonal conflict (which is directly associated with hypereridism) was significantly more frequent as a main precipitating cause in attempted than in consummated suicide, in contrast to causes arising from economic stress and somatic illness taken together (which do not provoke hypereridism). 3. In both attempted and consummated suicide, cases precipitated by interpersonal conflict involved a significantly greater number of young women than cases brought on by economic stress and somatic illness. 4. In all cases of suicide, whether consummated or not, precipitated by interpersonal conflict, the methods employed were not so much those known to have a low fatality as those which were most readily available.

From these observations the general conclusion could be drawn that an understanding of attempted suicide required an analysis of the interpersonal conflict often involving young women, provoking hypereridism in them, and frequently precipitating in them impulsive suicidal acts or indirect attempts to manipulate the environment. It may be expected that interpersonal conflict, rather than economic stress and somatic illness, produces hypereridism, since the latter exert an *impersonal* pressure that slowly leads to sorrow and despair, which cannot be alleviated by threats or appeals. Interpersonal conflicts as main precipitating causes included recent quarrels, parental scolding, chronic family strife, desertion by a spouse and unrequited love.

In our material, 3.7 ± 1.6 per cent of the male cases of consummated suicide had interpersonal conflict as the most significant precipitating cause; 40.2 ± 5.4 per cent was the corresponding figure for females. In the case of attempted suicide, the figures were respectively 22.9 ± 5.0 per cent and 50.6 ± 5.3 per cent. Findings of this general kind cannot be unique, but it is possible that our relatively high figures for women were a reflection of their subordinate status in the traditional culture, with its patriarchal orientation and male dominance.[2] Appended below are three selected case histories which illustrate very clearly the state of hypereridism, especially the ambivalent direction of the subject's aggressivity.

The general characteristics of hypereridic suicide, *i.e.*, suicide manifesting a strong and unstructured hypereridism without the appearance of neurotic defense mechanisms can be summarized as follows. 1. Socially, the subject is in subordinate relation to another person (or persons) and is under provocation by the latter. 2. More specifically, the provocator is a parent (usually the father), or husband. 3. In personality

* J. Ment. Sci., vol. *104*, April, 1958.

[2] In our study we were also able to demonstrate the extraordinarily high suicidal rates for young persons, especially women, in Peking some forty years ago.

the subject is often aggressive, irritable and quarrelsome, but on the other hand she may be immature and appear unusually meek and yielding. 4. The precipitating cause of the suicidal act is an acute quarrel or scolding, perhaps the culmination of a period of chronic strife; but in some cases there might only have been a minor reprimand. 5. The suicidal act as a rule comes within a day of the quarrel or reproof. 6. It is mainly to be found among women, especially of the younger age groups.

BEARING OF HYPERERIDISM ON OUTCOME OF SUICIDAL ACTS

The paradigm of the hypereridic state is to be seen in the acutely frustrated child who is at once tearfully sorry for himself and also aggressively angry with his frustrator; his aggressiveness is vented in confused and destructive activity directed both against his environment and (often) on himself, *e.g.*, by biting his hand, or knocking his head on the floor. It is almost as though the tension induced has obscured for him the outlines of his ego, so that his body as well as the outside world becomes the target of his own hostility.

Since non–consummation of suicidal acts is closely associated with the hypereridic state, it may be suggested that the "failure" occurs because such acts are impulsive, poorly planned or unplanned, and are therefore bound to be inefficiently carried out. At the risk of oversimplification it can be argued that this mainly is responsible for the failure, rather than insincerity in the desire to die, although other factors, including those making accidentally for failure, must also be involved. To say this is not to deny that some suicidal acts are merely threats or gestures. The mistake is to identify impulsiveness with spuriousness, and therefore say that if the attempt followed interpersonal conflict it could have been meant only as a threat; or that if the method used was not by its nature sufficiently dangerous, therefore it was chosen with foreknowledge of this. It would also be misleading to say (*e.g.*, as Murphy (19) does) that if attempts occurred at a time of the day when people were up and about, therefore they must have been deliberately timed to take place then, so that intervention was likely; for equally it could be argued that such attempts were probably precipitated in large part by interpersonal conflict, which, provoking hypereridism, would result in suicidal behaviour without delay.

It is necessary to understand the impulsivity and reactivity of this kind of suicidal act when faced with the question whether it is genuine, or planned blackmail never intended to succeed, or perhaps an hysterical reaction unconsciously or subconsciously motivated, with a secondary gain. The hypereridic state, as has been seen, is associated with a varying degree of clouding of consciousness, blurring of the boundaries of the self with the environment, narrowing of the field of attention and automacity of reactions. This recalls Kretschmer's hypoboulic reactions, and Kretschmer (15) has pointed out how easily these reactions grade into hysterical ones. This I have discussed in some detail elsewhere (26). Many subjects cannot in retrospect give a full and convincing account of their feelings and behaviour immediately before the suicidal act; they cannot tell honestly whether they really wanted to die, or merely wanted to threaten or hurt. Such cases were probably motivated by deep, primitive emotions of hate and guilt in a blind and explosive manner, rather than by judicious, discriminative and purposeful thought. Even if we allow that clear cut motives do operate in suicide, either to die, or to appeal, there can be no reliable way of identifying "genuineness" of intent. It is also clear that if "genuineness" is to be determined by examination of the contents of the subject's unconscious mind, the problem is one of even greater difficulty, for the presence of an unconscious wish to die in a given case could hardly be

excluded with any degree of finality. The truth is that psychodynamically there can be no clear distinction between serious and spurious suicide, as Stengel (23) has pointed out, and as the concept of hypereridism implies. An attempt fails less because a genuine intention is directly frustrated by factors of chance, ignorance, mistake and intervention, as Weiss (25) in part appears to suggest, than by the operation in large measure of the disorganizing effect of hypereridism on the subject; and the latter too is in such a state incapable of fully discriminative and planned motivation.

HYPEREREIDISM AND PSYCHOPATHIC PERSONALITY

A survey of the literature on suicide shows that workers interested in its pathodynamics have as a rule paid little attention to clinical diagnosis; while those who have emphasised the diagnosis of psychopathic personality, "personality disorder" or hysteria have seldom ventured into psychopathology. However, Teicher (24) and Hendin (10) have made studies along dynamic lines of the personalities of cases committing suicide, pointing out their immaturity and their need to force attention from others. Finn (8) stressed their strong dependency demands, maternal fixation, poor psychosexual development, narcissism and impulsivity, after studying them with psychometric techniques.

Many who under ordinary circumstances are easily plunged into abnormal hostile tension and are at the same time incapable of having it converted into structured neurotic symptoms—in a word, many who are predisposed to hypereridism—are so because they are immature, inadequately socialized, and possessed of more than average hostility. Such persons are prone to transient, recurrent, explosive and destructive behaviour, usually regarded as antisocial and discussed under the term "psychopathic reaction" in its narrow sense. The relation of this kind of behaviour to suicide has been noted by a number of authors. Kurt Schneider (22) subsumed one of his classes of suicide under the concept of "primitive reaction"; Conrad (4) pointed out the frequency of suicide in "epileptoid" persons, and Henderson (9), Dahlgren (6) and Batchelor (2) similarly.

Cleckley (3) agrees that suicidal "gestures" were frequent in his psychopathic cases, but would regard aggressiveness as merely an additional, complicating feature, rather than an essential one. He points out that Henderson's predominantly aggressive group were thought by Henderson himself to have probably suffered from cyclothymic, schizoid or epileptoid personality disorders, which Cleckley would not call psychopathic. Leaving aside such questions of arbitrary definition, however, we find that most workers have, in delineating the group of psychopathic personalities, attached significance to the qualities of excitability, impulsiveness, irritability and aggressiveness; *e.g.*, Kraepelin (14), Kahn (12), Kurt Schneider (22), Partridge (20) and, of course, Henderson (9). Hill's "dysrhythmic aggressive behaviour disorder" (11), founded on neurophysiological evidence suggesting cortical immaturity, is a concept clearly relevant to our subject; careful study showed that the more aggressive the subjects, the more likely were the electroencephalograms to be abnormal. Similar investigations by other workers have shown discrepant results, but this was probably because of the selection of material. Indications of an organic basis for aggressive psychopathy does not, of course, invalidate a psychodynamic interpretation of the condition.

In the very difficult field of psychopathic personality, advances are perhaps to be looked for not so much in further minute description and classification of cases as in the formulation of some principle or principles of interpretation. This is indeed essential if psychopathic personality is to be studied against a cross-cultural back-

ground, a task the possibility of which has not hitherto been raised. An important, albeit preliminary, step towards this object is the penetrating analysis by Curran and Mallinson (5) of the concept of psychopathic personality in British and American psychiatry. They indicate that it includes the following basic notions: first, persistent abnormality of character; second, episodic "short-circuit" reactions; and third, asocial or antisocial behaviour. It is evident that the type of personalities prone to hypereridism that we have been discussing fits well into these criteria, if criteria they may be called. As regards the third criterion, this raises abstruse questions when applied specifically to hypereridic suicide, for here cultural attitudes varying with time and place are involved. However, being antisocial in itself is not an attribute of all psychopathic personalities, as Curran and Mallinson themselves admit, and it may be doubted if the hypereridic element is absent from suicide even when it is culturally approved.

The question remains whether psychopathological insight can help us to understand or interpret the nature of psychopathic personality as a class. It is not possible to make any generalization in this respect. While not all the different types of psychopathic personality that have been described are characterised by unusually aggressive behaviour, nevertheless this trait is common among them as a group, in so far as the latter has been defined by a majority of workers in this field. It certainly serves to differentiate a very important subgroup. Inasmuch as aggressive psychopaths exhibit their abnormal explosive behaviour when faced with frustrations that ordinary persons take in their stride, they may be presumed to have a more than average endowment of aggressiveness. It seems fruitless to debate the point, as Cleckley does, whether this exhibition of aggressiveness is due to deficient control or not, for it is impossible to measure the strength either of drive or of control, each as an isolated factor. Perhaps it is more useful to say that these persons have a low frustration tolerance, to adopt Rosenzweig's concept (21). The recognition of hypereridism and level of frustration tolerance makes it easier to understand and to delineate aggressive psychopathy, and opens the way to the study of this condition from a cross-cultural point of view.

Here only a brief and tentative statement of the problem need be made. Clearly, the diagnosis of aggressive psychopathy must rest, not simply on a description of behaviour, but also on an understanding of the cultural (as opposed to biological) factors which influence frustration tolerance and the genesis of hypereridism; factors, for example, like the learning of culturally supported techniques of aggression, or training in adaptation to frustration. Tolerance to frustration may vary from group to group, each with its own standards of what is approvable. An individual can only be dubbed an aggressive psychopath against his own group norm for frustration tolerance. The diagnosis, for instance, may not be plausible in the case of the Malay running amok (a condition not seen in Chinese), nor similarly in the case of young Chinese women whose traditional subculture denies them techniques for self-assertion.

SUMMARY

A significant reason why many suicidal acts fail to end in death is that they have been precipitated by acute interpersonal conflict, leading to a manifest hypereridic state, marked by impulsivity, uncertainty of purpose, lack of planning and inefficient execution of the act. Persons predisposed to exhibit hypereridism are often of the aggressive psychopathic constitutional type; but hypereridism may also be detected in persons whose culture normally denies them opportunities for self-assertion, and who need not be suspected of having any anom-

aly of biological drive. The general question of the diagnosis of psychopathic personality in comparative psychiatry is raised.

CASE HISTORIES

Case 1. K.S.H., female, aged 20. Her father had left for the United States in her childhood, but her mother remained in Hong Kong. The patient had come down to Hong Kong three years previously to join her. She had been studying in a junior middle school, but after an affair had given birth to an illegitimate child. In Hong Kong she was not occupied and did not attend school.

In personality she was sullen, irascible and immature. Her intelligence was average. She often suffered from insomnia, giddiness and dysmenorrhoea.

She fell in love with a cousin and became pregnant by him. Four months before her attempted suicide she had an abortion. During this period she kept insisting on his marrying her, although he was still at school. After the abortion, during a quarrel with him, she had several hysterical fits; these consisted in tonic muscular spasms without actually producing a fall, but on one occasion she appeared to have lost consciousness. At other times she would complain of giddiness and pains in the stomach. During a quarrel with her cousin the patient had beaten him and threatened him with a chopper; she had also bitten him, *and herself as well* (*she showed teeth marks on her forearms*). Matters came to a head when the boy's mother forbade him to see her again. At 11 P.M. one night they had a violent quarrel in which she attacked and bit him as well as threatened to commit suicide. She made an attempt to jump out of the window. That same night at 4 A.M. she drank a bottle of hair oil, and was only discovered when her mother heard her groans. She had been sleepless all night.

On examination she appeared quite bland about the whole episode, admitted her difficulties and her continuing wish to marry the boy, but denied any attempt to "blackmail" him. She was not sure whether she would do it again.

This case involved a markedly hysterical girl using suicide as a threat to manipulate her environment. Hypereridism was marked.

Case 2. C.W., a female clerk aged 23. The patient's father had died before her birth, and her mother died while she was an infant. She was brought up by her grandmother until the age of six and then by an aunt. She had had one year's study at a university in Shanghai. She had previously worked as an accountant but had been dismissed because of an irregularity in her figures.

From childhood the patient had been unwanted by those who were placed in the position of bringing her up. She suffered intermittently from pains due to peptic ulceration. She was intelligent, meek and submissive, worked hard, was often fatigued, and suffered from insomnia, headaches and dysmennorhoea.

The patient supported her grandmother, uncle and aunt and also sent money to another relative in Shanghai. This she had to continue with, even though her uncle with whom she now lived had once thrown her out of the house when she was unemployed. She owed her job to her fiancé, of whom she was not particularly fond. Although they had been physically intimate, she had tender feelings towards another man. This situation caused her to be unhappy and irritable and one month previously she threw a number of hysterical convulsions, the precipitating cause being a demand from her grandmother for money. She continued to be unstable in mood, laughing and crying, and was at times confused in speech. She also complained of headaches and insomnia. She brooded for long periods and then would suddenly become angry and tearful, aggressive and destructive, *biting her arms and pulling at her hair.* On one

occasion she took an over-dose of hypnotics, but did not succumb.

Seen first as an outpatient, she was admitted because of the likelihood of another suicide attempt. The patient revealed that when torn by anger and depression, she sometimes could not control herself and just felt she wanted to die. She hated herself and everyone around her at those times, but did not admit to serious planning of her suicidal attempt. She gradually recovered her emotional equilibrium with psychotherapy and was discharged after five weeks.

In this case the hypereridic state was clearly due both to her previous personality and to environmental pressure. It would not be possible to ascribe her suicidal attempt solely to a desire for punishment or to an intended threat, or even to the need to escape from her difficult situation in life.

Case 3. L.N.N., a woman of 44, married to a fisherman and living on a boat. She was childless and as a result the husband had taken a young concubine who had given birth to five children.

The patient was a hostile, aggressive and irritable person, rather jealous of the power accruing to her as the principal wife, although she got on well with the concubine, a submissive woman.

The husband was an opium smoker and, needing such money as he could spare for the drug, he seldom gave any money to her. She had to depend for support on her adopted son, who had left the family after his father had beaten him when the son had remonstrated with him over his addiction. The husband furthermore refused to allow the patient to go out to work or to become a Christian, and she had refused sexual relations with him. One and a half years previously he had beaten her badly, and following that she developed an inconsistent limp for a period, very probably of a functional nature. The chronic conflict reached a new intensity about two months previously when she became angry, uncooperative, erratic with her food, and poor in sleep, saying that she was ill with a pain in the chest and going mad. She fought with her husband, *biting him and also on several occasions herself.* Once she asked her husband, "I am mad and why do you still smoke opium?" She had made two previous suicidal attempts, once in the night following a slap by her husband, a year previously, and a second time six months previously one forenoon. Just before being seen at the outpatient department she had again made three attempts at suicide within a week by jumping overboard, at 12 noon, 1 P.M., and 4 P.M. respectively. On each occasion there was quarrelling. She could not swim. She had been tied to the mast, but she managed slowly to loosen the restraining rope, and shouted out her intention to die.

The patient was full of hostility towards her husband when examined, and was admitted because of the danger of further attempts. She revealed that whenever she brooded over the past and had nothing to occupy herself with she would think of suicide. She thought life was not worth living, and felt she could not live with him any longer, yet she could not divorce him because it would be shameful. But she thought she was prepared to wait longer to see if he would change.

This case showed predominantly demonstrative suicidal attempts, which involved both the elements of appeal and threat. The underlying hypereridism, however, was unmistakable. The reactivity and impulsivity of her attempts were marked and it was possible that the patient cared little if she really did kill herself.

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NEW SYMPTOMS OF CLOSING-IN AND THEIR INTERPRETATION

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Muncie published an interesting article about the "closing-in" symptom in the Journal of Nervous and Mental Disease in 1938. Since that time the closing-in symptom has been rather neglected. Most investigators consider it as a relatively rare symptom of minor importance. We will try to demonstrate that closing-in is rarely found because only the very pronounced cases are noticed, and a variety of less obvious manifestations are overlooked. These manifestations will be described and a theory will be advanced to suggest that the closing-in symptom is not a peculiar phenomenon of little or passing interest, but is in fact related to the most essential problems of spatial organization. Before analyzing our own cases we will present a brief summary of the literature and of the main attempts to interpret this phenomenon.

Mayer-Gross (4) described several patients who could not copy block designs, mosaics or drawings, but felt obliged to put the blocks on the model and to draw along the lines of the model. He called this the closing-in symptom. Similar behavior appeared to occur with respect to their body-space: the patients could not imitate arm-postures, but brought their hands close to those of the examiner. Mayer-Gross proposed the following interpretation: "Teleologically we might speak of a fear of empty space. During any manual performance the hand pushes away from loneliness, as it were; it tries to find company in anything that fills up the space. The tendency gets stronger and is more manifest in proportion as the spatial tasks appear more difficult. The spontaneity and the promptness of this symptom gives one the impression of a primary biological protective mechanism".

Muncie (7) tried to show that the closing-in symptom is only one manifestation of a larger disturbance, best interpreted as a difficulty in making an abstract copy from a concrete model through symbolization. He gave several examples. A three year old girl was shown a colored picture of lemons. She was not satisfied with the picture alone, but wanted to place a real lemon on it. She repeated this behavior with many pictures. Muncie suggested that she had difficulty with the abstract symbol (the picture) and so closed-in on the concrete object (the lemon). A 56 year old arteriosclerotic showed constructive apraxia with typical closing-in. In addition he had echopraxia and echolalia especially in difficult tasks; the patient automatically repeated the last word spoken by the examiner. He "put his copy on the model", so to speak, and did exactly as the doctor. In effect, he closed-in on the model.

Ajuriaguerra, Zazzo and Granjon (1) made a very important contribution to the clinical description and interpretation of the closing-in symptom. Their patient was a 51 year old woman recovering from severe carbon monoxide poisoning. She showed constructive apraxia with the following interesting features.

1. She built on the model, even for so simple a task as copying a cross and a square.
2. Sometimes she had only partial closing-in; when she built a body out of the parts, the spatial structure was correct except for the legs, which were attached to the distal end of the arms.
3. The patient tended to fill the empty spaces of all her constructions. She did not draw separate points in Bender's

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Visuomotor Gestalt Test, but joined the points, thus filling the spaces between them.

4. A similar tendency appeared in the completion of open drawings to closed ones.
5. When she wrote, she did not use the middle of the paper but wrote along the edges of the page. She left no empty space between letters and words, even writing the following letter on the same spot, so that several letters were superimposed.

The investigators also made an important step toward a deeper understanding of the closing–symptom. They maintained that there is a disturbance of conceptual space; the patient cannot project a framework onto the paper and draw in it. In order to place a stick in a certain direction of space, one must situate this stick in the general structure of space. If this frame of reference is destroyed, the direction of a stick can no longer be perceived nor realized. They considered closing–in as but one aspect of a general disturbance of relational thinking, which appears every time the patient has to organize a group of elements; for example in copying a drawing or in defining an object.

FURTHER OBSERVATIONS ON CLOSING–IN SYMPTOMS

There follows a description of two cases. Although they present many interesting features, only the closing–in symptoms will be reported in detail.

Ina, a 13 year old girl, was born in 1943 after a difficult delivery lasting two days. There was cerebral hemorrhage and spastic paralysis. She first sat at two years and stood at the age of three. At the time of our observations she appeared to be a normal, well–adjusted and happy child. Ina was in the 5th grade and performed satisfactorily in all subjects except arithmetic. She walked, ran and performed manual tasks such as knitting and writing.

On neurological examination in 1956 the neurologist of the "Spastic Team of Amsterdam" found a left infantile spastic paralysis with hemiatrophy of the left side, paresis of the VIIth nerve (peripheral type) and a slight upper extremity hyper–reflexia on the left. Touch, pain and two–point discrimination were unaffected, and there was no inattention to bilateral simultaneous stimulation. There was no dysphasia, dyspraxia or agnosia, but slight dysarthria. There was no ataxia and a negative Romberg. An operation was performed in 1951 for strabismus, with paresis of the left superior oblique muscle. Five years later opthalmological examination disclosed a defect in visual acuity of 25 per cent on the right (after correction of myopia and a slight amount of astigmatism) and 66 to 75 per cent on the left. Eye position and movements were normal. There was strong suppression in the left eye. There was no stereoscopic vision but good peripheral fusion.

Her Terman I.Q. was reported to be 61, and this low score was clearly associated with her inability to perform well on spatial tasks. Reading, writing and scholastic knowledge were at a 5th grade level. She could perform all elementary operations in arithmetic but could not utilize them in solving problems. The most prominent symptom was a profound spatial disturbance with constructive apraxia. The higher levels of the body–scheme were disturbed and she was unable correctly to imitate complicated arm positions. She correctly copied simple constructions with blocks, sticks and mosaics without any closing–in symptoms, but never on a level higher than six years. Her free drawings were also judged to be at a six year level.

During the examination and throughout the course of spatial therapy, which was given twice a week for six months, several subtle closing–in symptoms became apparent.

1. During the first months of therapy it was very difficult for the patient to

draw an oblique line. Even when she could put one or more sticks correctly in any oblique direction of space, the motor execution in drawing was very poor. When she was asked to copy the right triangle shown in Figure 1, she always first drew the horizontal and vertical lines and then tried to join the two endpoints with an oblique line. As this line was consistently incorrect, we demonstrated with a pencil where the line should be. Although the patient attempted to follow the example, she invariably deflected and again pursued the curved line she had drawn previously (Figure 1). With respect to this task, this behavior persisted during several weeks. We consider this to be a closing-in symptom. It was as though she could not draw the oblique in empty space and so clung to the concrete, tangible model provided by her first response.

2. When the patient's drawings of oblique lines on unlined paper had significantly improved (three months after the beginning of treatment), she was asked to make drawings on graph paper. We were then very surprised to find a marked deterioration of the oblique, since it was expected that the framework offered by the small squares might contribute to an improved performance. Figure 2 demonstrates this behavior. The patient first drew the horizontal and vertical lines and then attempted to join the two endpoints. Despite her

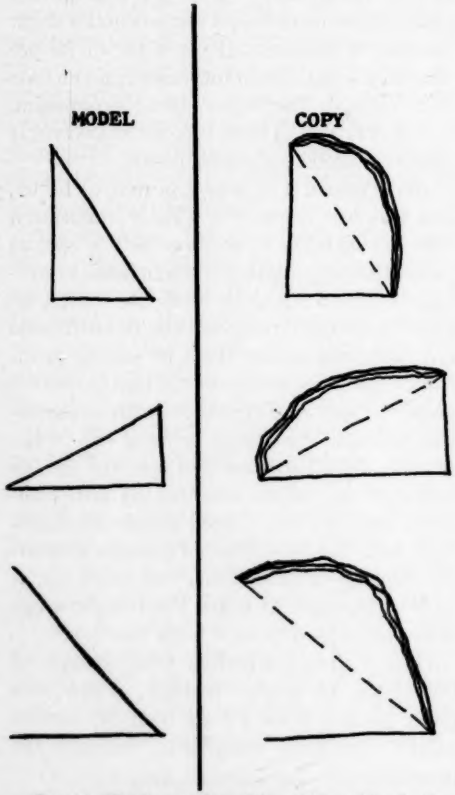

FIG. 1. Closing-in for oblique lines. The dashes indicate the direction in which the pencil was moved in order to make the patient aware of the exact line.

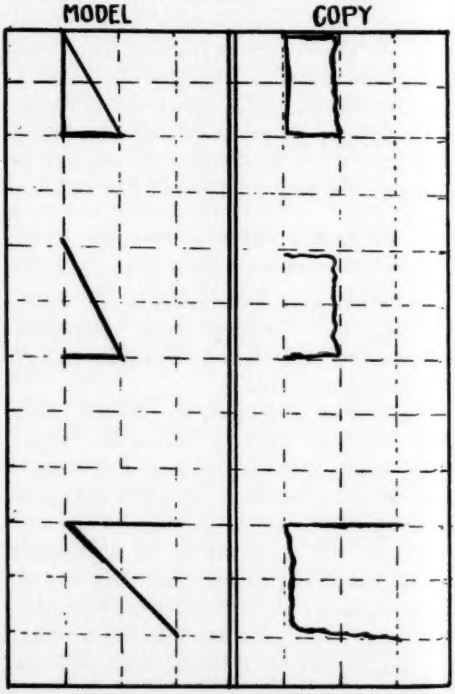

FIG. 2. Closing-in for oblique lines on graph paper.

efforts to draw the oblique line she consistently tended to follow the lines of the graph paper. This behavior persisted through many trials, and is considered to be a further symptom of closing–in. The formation of the oblique was fairly normal on unlined paper at this time, but was again distorted when graph paper was used. Here the available space was not empty, and the patient seemingly used the lines as a kind of support in her drawings.

3. When this kind of closing–in symptom was finally overcome (some six months after the beginning of treatment), it was possible to make it reappear in more difficult situations, *e.g.* when she was asked to draw a tree (Figure 3).
4. At about this time some unexpected difficulties arose in the process of learning how to draw complex patterns of oblique, horizontal and vertical lines. Although the oblique line was always drawn satisfactorily when in the model it was presented alone or as a part of a triangle, it was often reproduced incorrectly when shown as a part of a parallellogram, trapezoid or other complex geometric form. It was surprising to learn that the patient would draw a given oblique with considerable accuracy if she was asked to draw the oblique line first and not after several other lines had been completed (Figure 4, a, b, d, f.). (Similar behavior was observed when sticks were used.) On the basis of this type of observation we would hypothesize that the inability to draw oblique and even vertical lines in complex figures may be caused by the distorting influence of horizontal and vertical lines previously drawn.

Such phenomena as these can perhaps best be explained by a gestalt interpretation of space–functioning, but here we wish to emphasize another point. The line drawn incorrectly is always displaced in the direction of lines already completed. In Figure 4, a, line y should be parallel to line x, but instead converges upon it. The same process may be observed in every example. It should be noted, in models c and g (Figure 4), that this tendency to convergence has enabled the patient to reproduce the drawing correctly. In both instances line y converges upon line x in the example, and we would speculate that this has facilitated the correct reproduction. That is, the closing–in tendency apparently was not withholding the exact direction of y. We feel that these observations suggest another symptom of closing–in. The patient has drawn her oblique lines as though she wanted to "close in" on the previously drawn lines, to seek them in order to avoid entering empty space, and in order to create a closed figure. The same tendencies were observed in hundreds of drawings during subsequent weeks of treatment.

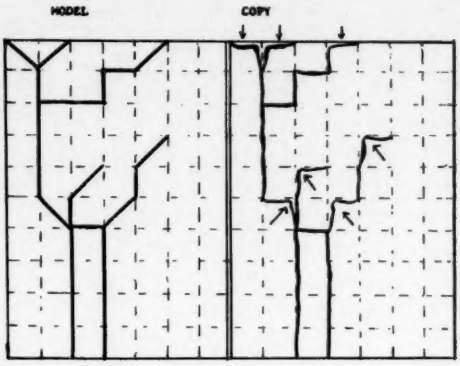

FIG. 3. Reappearance of the closing–in symptom in a complex situation; drawing a tree. The oblique lines tend to follow the squared background of the paper. Arrows indicate where closing–in takes place.

We would conclude that this patient presented subtle closing–in symptoms which were observed only in the attempted reproduction of oblique lines.

Gaby, a Dutch girl twenty years old at the time of observation, had a reported normal childhood development until the age

of three, when she contracted encephalitis. She had some language disturbance afterward but recovered quickly. She entered school and progressed normally except for a marked inability in arithmetic. Results of the examination are described in Encéphale (1958): the main symptom was an impossibility of drawing one single oblique direction: from left above to right below.

Neurological diagnosis: normal, except for a tendency of the right arm to deviate in adduction, flexion and pronation. There was paresis of conjugate deviation to the right. Her Terman I.Q. was 63. Reading and writing were judged to be excellent in both Dutch and German. There were no abnormalities in the body-image, nor disturbances of the visual or praxic functions.

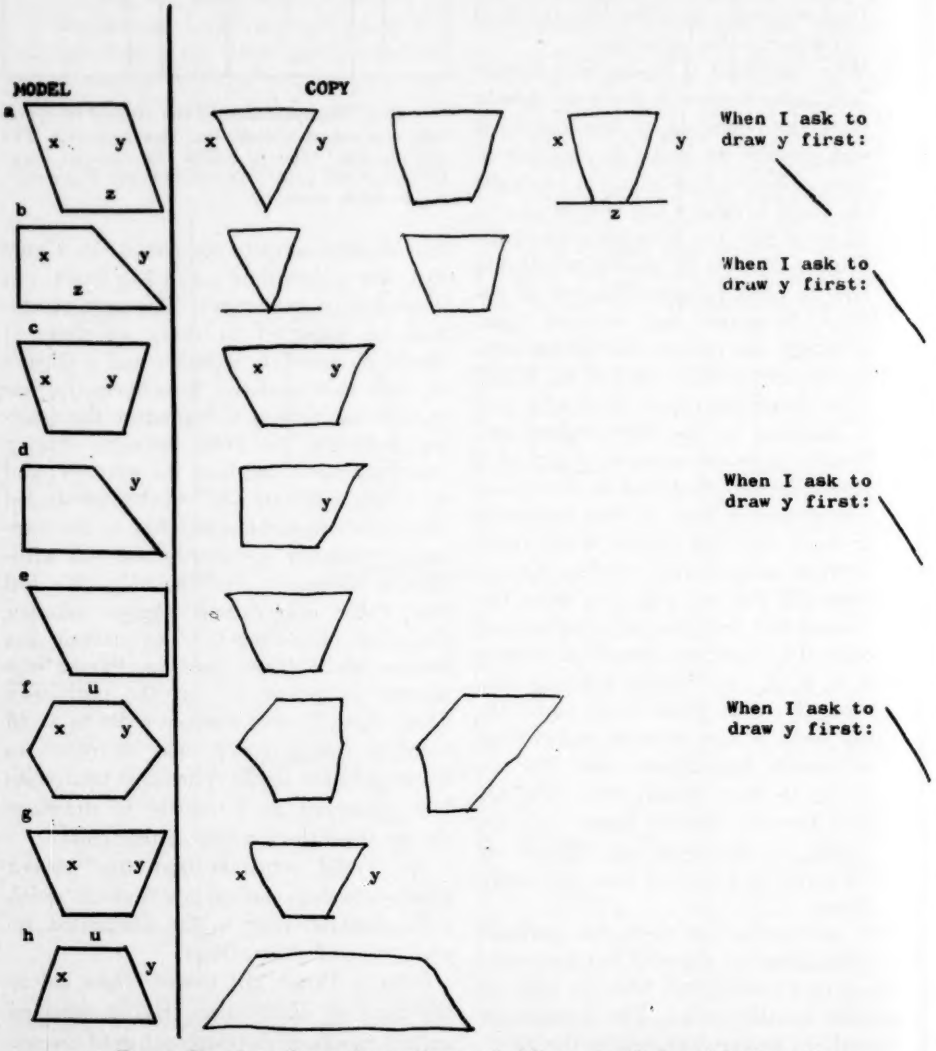

FIG. 4. Drawing of complex patterns of obliques, verticals and horizontals.

An inspection of the drawings of this patient suggests that she exhibits a particularly subtle form of closing–in symptomatology. Figure 5, a, presents a model that she was unable to draw accurately. In the first trial line x was drawn in close proximity to line y, as though the patient was unable or unwilling to penetrate the empty space. Succeeding trials show line x correctly represented; in each case, however, false starts are seen that reveal the closing–in tendency. It would seem that some conscious force is needed to overcome the latter.

In figure 5, b, the conflict between closing–in tendencies and an awareness of the proper configuration of the model, is clearly seen. In the first trial she has drawn correctly lines 1, 2 and 3. Then she placed the pencil at point x, and hesitated for a long time in obvious conflict. Abruptly and with an apparent release of tension she then quickly drew lines 4 and 5, thus creating a closed figure and avoiding the open space in the

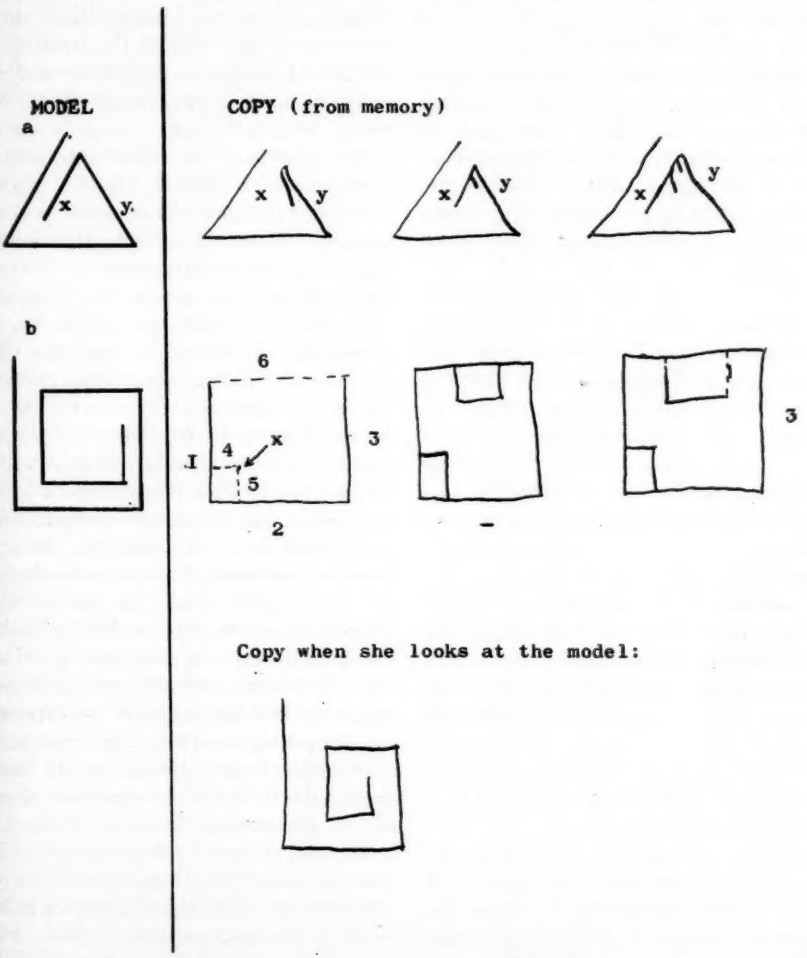

FIG. 5. Closing–in is only found in drawings made from memory.

center. Finally she drew line 6 to close the total figure. In speaking of this production the patient clearly indicated that she was aware line 6 was unnecessary. Further trials revealed the same general pattern of response. Presumably she knew what had to be done, but her conscious intent was blocked by primitive automatisms. It is interesting to note that this closing–in behavior occured only when the patient copied the figure from memory. In copying directly from the model, the symptoms did not appear.

INTERPRETATION

Previously only those cases have been described in which the closing–in tendency appears to a massive degree. These patients exhibit closing–in for all their spatial constructions. The spatial disturbances of the patients reported here are much less severe and closing–in is demonstrated only in more complex tasks.

Why is it that the first patient showed closing–in only for oblique lines? Perhaps because the oblique direction is very difficult for her: drawing an oblique line is a complex performance, necessitating an awareness of the oblique direction in representative space. Before the act of drawing the subject must be able to visualize this direction in a framework existing only in representation. This act is extremely difficult for this patient, as awareness of the oblique without perceptual support is almost impossible. She relies on the perceptual cues of concrete space because representation in empty space is too weak. The same "regression" is not necessary for horizontal and vertical directions as it is much easier to be aware of them in the empty frame of representation: here she does not need a concrete perceptual support.

We would conclude that closing–in can appear whenever representative space is in a process of disorganization and when the awareness of direction is only possible with the help of perceptual cues. Closing–in symptoms indicate that representative space is in a borderline situation: exact representation of the direction is not entirely impossible, and cannot materialize without perceptual aid.

A further observation should be made, which has not yet been mentioned in theories about closing–in. The difficulty in the psycho–physiological construction of the oblique cannot be the only factor involved: when Ina could draw oblique lines normally on unlined paper, at the same time those drawn on graph paper were badly distorted (Figure 2). It was obvious that she was attracted by the sides of the small squares. We would postulate that hand and pencil are attracted by the optical stimuli in the visual field and that closing–in can be a subtle symptom of forced grasping: the hand moves to what is visually perceived. The same phenomenon appears in the first symptom: when Ina had drawn an incorrect line and had attempted to draw an exact oblique, she constantly repeated her inaccuracy. Her fourth symptom also seems to support this interpretation: the oblique line became disorganized when other obliques, horizontals or vertical lines were present (Figure 4). We think that the visual cues of the lines already drawn attract the moving pencil. This phenomenon is complex and occurs only in certain configurations of the visual field; for example, when x is directed outwards, y is not attracted (Figure 4, h). Here probably other laws of symmetry and equilibrium are operating in the organization of the perceptual field: line x is moving outward and might push y outward. The figure might be experienced as expanding or diverging. Further development of this concept would entail a lengthy discussion of the dynamics of pathological gestalt–organization. Bouman and Grünbaum (2) published a case history demonstrating that these smaller and more subtle forms of the optical grasping reflex do exist. A young man with diffuse cerebral disturbance of syphilitic orgin showed the

usual form of forced grasping in the left arm and an unusual form of forced grasping in the right arm. When several blocks were close to each other on the table he could not pick out a single one but had to take them all, although he consciously tried to avoid this. He could not put a block at a small distance from another block, but would put it on top of the former. He could not write one letter beside another, but wrote it on top of letters already written. When he tried to write and the examiner placed his own finger on the paper, the patient automatically moved the pencil to this finger.

An interpretation of closing–in cannot be complete without stressing the enormous importances of gestalt–psychological principles. We often see that primitive gestalt–tendencies break through. The second patient in this report transformed open figures into closed ones. From the description it will be clear that very primitive gestalt laws are at work here and that strong forces are operating to close the shape. In the case of the first patient there was a very strong tendency to transform the model into a more equilibrated, simple and strong gestalt. Whenever there was asymmetry or tension, her copy is more symmetrical than the model.

The same basic qualities of visual gestalt–organization can be observed in normal persons by tachistoscopic exposure of drawings. These are perceptually simplified in the sense that open drawings are completed to form closed figures. Why do these tendencies break through behaviorally in our patients? First, one might think of a disturbance of the "abstract attitude", as described by Goldstein and Scheerer (3). In the material here reported there is indeed a striking resemblance to the symptoms described by these investigators. In order to copy an asymmetrical model, a very pronounced "abstract attitude" is necessary. One must not follow the spontaneous gestalt–tendencies, but must analyze line after line. It should be noted, however, that no other symptoms of the "concrete attitude" could be found in the verbal or spatial performances of these patients. Moreover, in the discussion of the closing–in symptoms of the second patient (Gaby), it is clear that the "abstract analysis" of the structure is normal because she can report her errors. This seems to be an interesting contribution to the clinical phenomenology of "abstract and concrete behavior". Sometimes the abstract and concrete attitudes coexist: the patient operates normally on the abstract level but suddenly manifestations of the underlying concrete attitude cannot be repressed and come to the surface.

SUMMARY

The literature on closing–in symptoms has been briefly reviewed. Two cases were described in which several new symptoms of the closing–in tendency could be demonstrated. In one case there was closing–in for all oblique lines, and in a later period only for oblique lines appearing in complex configurations. In the second case the closing–in tendency was demonstrated only in figures drawn from memory.

The following etiological possibilities were discussed.

1. Difficulties in representative space: the representation of the direction that must be drawn, is impaired.

2. Optical manifestations of the grasping reflex, operating in certain gestalt–conditions of the perceptual field.

3. Liberation of primitive gestalt–tendencies towards simple structures–in–equilibrium.

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SOME PSYCHIATRIC OBSERVATIONS OF ULCERATIVE COLITIS WITH REPORT OF A CASE[1]

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Since the original reports by C. D. Murray (6, 7) in 1930 and A. J. Sullivan (9) in 1932, the importance of psychologic conflicts in ulcerative colitis has become established. Engel (1) has recently summarized the literature, adding his own comments and observations. The cases reported often do not provide necessary detailed information to test the validity of psychologic and physiologic correlations. It is the purpose of this paper to present the observations gained from a study of a single patient who has been followed by the writers for the past ten years. The patient, a 50 year old woman, is one of the 70 ulcerative colitis patients who have been studied on the psychiatric service of The Mount Sinai Hospital. She is selected for presentation because of an unusually clear history of four attacks of both colitis and depression since 1945, following well defined, almost parallel life situations; and four remissions, (one of which lasted seven years) of the somatic and psychologic symptoms, with changes in ego defenses and character structure, following treatment by two therapists at different times using a specific psychotherapeutic approach limited in depth.

PRE–COLITIS PERSONALITY

This patient in her pre-colitis personality showed many obsessive–compulsive character traits. She was submissive and overly sensitive to the opinions of others and filled with many feelings of inadequacy. She formed dependent relationships with key figures in her environment. These observations are in keeping with those noted by Engel (1) and Groen (2) as occurring very frequently in colitis patients.

The compulsive traits and feelings of inadequacy started in early childhood. The patient was the youngest of four children. Her father was an illiterate, submissive man, while her mother was an aggressive, domineering woman who was a meticulous housekeeper. The older sister was father's favorite by virtue of her submissiveness in contrast to the patient's marked aggressivity. Until she was 13 or 14, the patient slept in her parents' room and, when father was out, often in the same bed with her mother. She frequently witnessed sexual relations, being frightened and crying whenever this happened. When she was seven, she saw a picture of the Crucifixion. The thorns of the crown looked like snakes, while the bright red blood frightened her. These fears persisted for many years. In school she did good work, getting along well with her teachers and classmates until the sixth grade when she and two others were set apart from the rest of the class because of pediculosis capitis. She developed a hatred for her teacher and had dreams of murdering her. In view of her parents' indifference, she resolved to, and did, leave school. During her teens, despite feelings of intellectual inferiority, she taught herself bookkeeping to achieve advancement at work.

Following her marriage at the age of twenty, her personality changed. She became submissive much like her father, but retained her compulsive characteristics. She formed an intense dependent relationship

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with her husband who seemed in many respects to be a maternal figure.

LIFE SITUATIONS PRECEDING ATTACKS OF COLITIS

The patient related the onset of her first attack of colitis and depressive feelings in the summer of 1945 to the following incident. In order to increase his earnings, her husband had taken an additional job, which involved collection of money. On one occasion, when she found herself short of funds, she, somewhat daringly for her, dipped into this money. Before she could return the money, the husband discovered the loss and raised a great fuss about not being able to trust his family. When she admitted that she was the culprit, he shouted at her, accusing her of stealing, and refused to talk to her for some days. The patient was humiliated and enraged. However, she could not voice her feelings because she felt she was in the wrong.

The subsequent attacks of colitis and depression followed somewhat similar circumstances. The second attack of colitis in August, 1948 began shortly after the patient learned that, during her first attack, her brother and sister had divided between themselves a small inheritance from their father. When inquiries were made as to why the patient had not been given her rightful share, the sister angrily retorted that the matter should not have been raised since she had done so much for the patient during her illness. The patient felt depressed and humiliated by her sister but could not express any anger. To add to her shame, her husband accused her of "being stupid for being taken advantage of". Once again she became depressed and developed colitis.

The third attack in the summer of 1955 came in a setting of fights and quarrels with her employer. She had been dismissed from her job ostensibly for frequent absences, but she felt that the new supervisor wanted a younger, more attractive woman. She managed to get a part–time job in another department in order to safeguard sick benefits needed for an elective operation. After the surgery, her employer accused her of being deceitful and again dismissed her. Then developed fights over unemployment compensation. She felt ashamed over the accusations, panicked and gave up the fight. Depression and colitis followed.

The fourth attack occurred in October, 1956. Her brother, who had never shown any interest in her, had an amputation of his leg for peripheral vascular disease. When the patient visited him at his home, she was berated by her sister-in-law who told her she should be ashamed of not having visited him in the hospital. The sister-in-law emphasized that the patient knew what it was like to be sick. The patient felt very guilty and dejected and was unable to defend herself. She then began to visit her brother daily for a two week period after which she became depressed and had a recurrence of bloody diarrhea.

It would appear that an accusation of wrong doing in a situation in which the patient felt ashamed and helpless preceded each attack of ulcerative colitis. In each instance she was unable to protest or properly defend herself against the, to her, humiliating charges and actions. All hostile reactions were suppressed. The similarity of life situations preceding the attacks of colitis and depression suggest the probability that these events were the precipitating stimuli.

COURSE OF COLITIS ATTACKS

The first symptoms of abdominal cramps and diarrhea appeared when patient was thirty-eight, in 1945. For two years she was treated on an ambulatory basis. Proctoscopy and barium enema findings were consistent with mild ulcerative colitis. In May, 1947 she was hospitalized on the medical service of The Mount Sinai Hos-

pital because of an exacerbation of symptoms. Ileostomy was advised and refused. She rallied, and in August was transferred to the psychiatric service for further evaluation and therapy. Her mood at that time was one of helplessness with depressive features.

During her month's stay on the psychiatric service, the patient was given a complete battery of psychologic tests including the Wechsler–Bellevue, figure drawings and the Rorschach test. The following is a summary of these reports. She obtained a verbal I.Q. of 116, performance I.Q. of 102, and a full scale I.Q. of 110 on the Wechsler–Bellevue Scale, Form I. The Rorschach protocol revealed poor marginal reality testing capacity and ego strength, low productivity, excessive intellectual impoverishment and affective inhibition coupled with pervasive anxiety. Several peculiar verbalizations and formulations pointed toward possible psychotic ideation. Terminal testing revealed aggressive and destructive impulses which were controlled by a clinging adherence to standard modes of behavior. The diagnostic impression was consistent with anxiety and depression in a passively compliant, obsessional character showing a trend toward psychotic depression.

Following her discharge she remained free of ulcerative colitis symptoms and in good spirits for one year, when she again developed anorexia, abdominal pains, six to eight bloody bowel movements daily and feelings of depression.[5] She was readmitted in a state of dejection for a three week stay on the psychiatric service, where she made a rapid recovery.

After seven years of complete remission, she had a recurrence of colitis and depression. Once again she was treated on an ambulatory basis at another hospital. Barium enema, soon after the onset, was reported as follows: "Roentgen examination of the colon shows a complete loss of haustral markings throughout the entire distal colon from the ascending colon distally. There is no distensibility of the rectum. There are multiple superficial ulcerations throughout the mucosa of the colon. There is marked contraction of the colon in both its transverse and longitudinal diameters. The cecum and ascending colon fail to balloon out in the normal fashion but there is a suggestion of haustral markings in them. There are in this area also noted superficial ulcerations. Conclusion: Ulcerative colitis involving the entire colon and rectum." Proctoscopy on August 25th, revealed hyperemic granular mucosa with many two to three millimeter areas of exudate. Colectomy was advised by a surgical consultant.

The patient, however, returned to The Mount Sinai Hospital Psychiatric Clinic where she was treated psychotherapeutically on a once–a–week basis for ten months. Remission of symptoms occurred within four months. Another barium enema done eight months after the previous one was reported: "There is no obstruction to the flow of the barium retrograde from the rectum to the cecum. Comparison with previous examination again shows the changes due to ulcerative colitis involving the entire colon with less degree of ulceration as compared with earlier examination. The right side of the colon now appears to have regained some degree of haustral markings. Impression: Ulcerative colitis showing interval response to conservative therapy."

After eight months of psychotherapy, psychologic tests were repeated. Evaluation of the formal aspects of the Rorschach revealed "improved contact with reality and concomitantly increased ego strength; and recognition of pressing affectional needs with greater freedom of expression. A focal need for approval, response from

[5] During the first and subsequent remissions, the patient was not seen on a regular, maintenance basis in the Psychiatric Clinic, although she knew she could always return. This was arranged in order to encourage feelings of independence.

others, belongingness and affection saturate the entire personality." Content analysis revealed an unremitting conflict with the mother figure which affected her self–concept as wife and mother. She harbored sadistic impulses toward the father–husband image and male authority figures in general. In summary, the test findings revealed the patient's ability to express conflicts in a manner which was impossible for her at the time of the first testing. The depressive coloration was gone. Moreover, it was noted that destructive impulses emerged in response to frustration of her oral needs, and were in part handled by denial, projection and direct expression. Diagnostic picture at this time "suggests a psychophysiologic gastrointestinal reaction in a passive–aggressive personality, passive–dependent type."

PSYCHOTHERAPY

The psychologic picture during her first hospitalization and during subsequent attacks was characterized by an overriding depressive tone. It was felt that the rigid obsessive–compulsive character structure combined with the marked depressive features indicated a weakened ego that would not tolerate a probing, uncovering psychotherapeutic approach. Therefore, a supportive, ventilative, superficial therapy was undertaken. In her sessions her spontaneous associations revealed feelings of tremendous rage and hostility. For example there were many dreams concerning snapping, biting, hairless cats, as well as some in which the theme of a dirty, ill–fed baby recurred. The patient associated the latter with her own child (daughter). She brought up many grievances against her husband and recalled that arguments with him had often led to an increase in the severity of her diarrhea and depression. On the ward arguments with another patient and with her sister also led to an increase in symptomatology. When she was shown that expression of her anger in appropriate situations did not lead to serious consequences, such as harm to the other person and/or retaliation, her diarrhea subsided. Following her discharge after one month of therapy, she was able to be somewhat more assertive at home. The same therapeutic approach was used during her brief second attack.

Seven years later when she returned to the psychiatric service, she was seen by another therapist who utilized essentially the same psychotherapeutic approach. She was encouraged to view and express her feelings of anger at the department store without guilt. Once again her symptoms subsided. As the depression lifted she reported several dreams in which she was chased by "horrible" cats. In one dream, she was terribly frightened by the sight of a mother cat eating its kitten. She could not understand such a dream, she said, since she has always loved cats, and had even nicknamed her daughter "Kitty"! She spontaneously spoke of the feeling that she had been a bad mother, having harmed her daughter by expressing openly so many fears about her welfare. It was suggested to her that she had actually done a great deal for her daughter and that her fears of inadequacy stemmed from early childhood experiences. There followed discussions of her childhood family relationships and school experiences with catharsis of long withheld associated anger. Following several painful discussions of the husband's controlling role in family finances, she was able to assume greater responsibility in determining the budget. For the first time the patient felt on an equal footing with her family and friends, and was able to be more aggressive in her relations with them.

When seen during the last attack, the similarity of circumstances preceding all four attacks of depression and colitis was demonstrated to her. The patient then spontaneously verbalized suppressed feelings of rage associated with the precipitat-

ing events. Following this one session discussion, her spirits lifted and the colitis symptoms subsided.

COMMENT: Because of a precarious somatic equilibrium easily disturbed by emotional stress and a clinical impression of an extremely brittle ego structure, it was determined that no attempt should be made to probe for unconscious psychologic material. Instead we felt that a more superficial psychotherapy utilizing such measures as support, reassurance, and encouragement was indicated. In fact, whenever the patient's productions suggested the possible emergence of pathogenic unconscious material, the therapist would deliberately interpret her productions as expressions of conscious or preconscious feelings relating to important relationships and situations. Thus, for example, the dream of the mother cat eating its kitten was handled not in terms of the suggested oral cannibalistic fantasies, but rather in terms of the patient's feelings of inadequacy. The feelings of inadequacy were then related to her consciously recollected childhood experiences as well as to current situations. She was allowed to express her anger associated with such memories as the sister's favored position, the lice incident, etc., and with incidents of later life. The therapist helped her in this direction by demonstrating that the expression of such emotions did not endanger her relations with him or with any other important figure.

DISCUSSION

Work with our patient revealed her to be an obsessive–compulsive individual who was particularly vulnerable to threats of loss of love or status. Expression of anger and rage was, for her, fraught with anxiety, guilt and fear. This resulted from condemnation by a harsh superego as well as the danger of loss of vital outside supplies of love and affection. Her life thus had been one of attempting in every way to control manifestations of hostile and aggressive feelings. When her controls were overwhelmed, she developed ulcerative colitis and depression. We conceptualize the steps leading to the onset of illness as follows.

1. Under the impact of stress situations, *i.e.*, censure by an important figure which occurred before each attack, hostile aggressive impulses were aroused and signal anxiety appeared.
2. The usual defenses of reaction–formation, isolation, denial, projection, repression, rationalization, etc., proved inadequate to control these impulses.
3. Possible loss of love from an important person and condemnation by her own superego threatened.
4. Other defensive maneuvers such as regression, introjection and turning of aggression against the self were brought into play.
5. Severe neurotic depression and colitis followed.

Many observers have commented on the life situations immediately preceding the appearance of colitis. Groen (2) noted that his patients developed ulcerative colitis after being subjected to "... emotional trauma, which involved a combination of acute love–loss and painful humiliation". He also said, "... a difficult situation that required an active solution had taken the place of the former sheltered condition. The patient, however, was not able to get out of the difficulties himself by making a decision or taking action". Engel (1) commented, "The onset and relapses of the disease were found to occcur in settings which represented to the patients real, threatened or fantasied interruptions of key relationships". Karush and Daniels (5) stated, "The attack generally began within 3 to 4 weeks or sooner after a sudden unforeseen threat to the security of a previously elaborated self–esteem system".

We do not know why our patient developed both ulcerative colitis and depression in the setting described. Such an occurrence has been previously reported in the literature and in fact, Engel (1) wrote, "... the disease (colitis) developed only when the corresponding affect was helplessness, despair, hopelessness, etc." Al-

ternations between, as well as varying combinations of, severe psychopathology (borderline states, psychosis) and psychosomatic disease have been observed on our service (4) and elsewhere. It is clear that the depression in this patient was a primary disturbance rather than a secondary reaction to colitis.

It is probable that the approach used by two therapists produced both quantitative and qualitative changes in her superego identifications so that there resulted a greater state of harmony between superego and ego. This in turn changed the general psychic economics, allowing for a shift of forces in the direction of a more satisfactory integration and expression of her hostile feelings. This shift of forces was strengthened by the therapist's use of inexact interpretations (*cf.* Glover (3)) which strengthened such ego defenses as displacement, reaction formation and rationalization. Before her marriage the patient was a troubled but aggressive individual, somewhat like her mother. Following marriage she changed, becoming submissive and placating, somewhat like her father. Intellectual inferiority was one of many feelings of inadequacy which dominated her thoughts and actions. Her husband was regarded as having many of the mother's personality traits. Every effort had to be made by her to control murderous, cannibalistic fantasies, perhaps in part directed toward her husband. Through therapy, modification of the superego and ego was achieved and the patient was able to more satisfactorily identify with the mother and thus see her husband more realistically. The important positive relationship which rapidly developed, with the therapist's active participation, toward her therapist aided the therapeutic process. This dependency relationship was of especial importance in the early restoration of the premorbid psychophysiologic state (*cf.* Mushatt (8)).

It is interesting to note that in the literature little is said about the effect of psychotherapy with ulcerative colitis patients. Groen (2), Karush and Daniels (5) are among the exceptions. Groen outlines a short–term therapy including catharsis and encouragement, successfully aimed at alleviation of symptoms. Karush and Daniels, on the other hand, attempted with mixed results to reconstruct basic character structure through long–term psychoanalysis. The procedure used with our patient resulted not only in an alleviation of symptoms, but also in modification of her defensive symptoms and of her basic character structure.

We recognize the difficulty of evaluating any therapy in a disease such as ulcerative colitis, which many regard as a chronic disease, subject to remissions. However with this patient whom we have studied over a ten year period, the attacks occurred only in a specific stressful psychologic situation. We feel that our psychotherapy enabled the patient more successfully to cope with such stress situations so that, even if quantitatively the stress were too great and colitis ensued, she could more readily mobilize successful adaptive responses.

Essentially, the aim of this therapeutic approach is the strengthening of the ego. Although it is referred to as superficial, the therapy is not entirely suppressive. It is based on an understanding of the underlying dynamics, ego weaknesses, and dangers involved in the treatment of patients suffering from life–threatening illnesses which are easily disturbed by emotional stress. It is applicable, in our experience on the psychiatric service, to many patients with severe psychosomatic diseases such as ulcerative colitis, bronchial asthma and some types of hypertension, where "depth" therapy is dangerous and hence not feasible.[6]

[6] Since this paper was prepared, in the spring of 1957, the patient had a reoccurrence of symptoms, under circumstances similar to those described.

SUMMARY

We have described a case of ulcerative colitis and have emphasized the following:

1. Apparent clear-cut relationships between precipitating factors and the somatic and psychologic (depressive) reactions to these stresses as seen over a ten year period;

2. Clear-cut remissions (one lasting seven years) of somatic and psychologic symptoms following a specific psychotherapeutic approach limited in depth;

3. Demonstrable changes in the bowel pathology following psychotherapy as shown by X-ray evidence of a return to a more normal mucosal pattern and

4. Modification of ego defenses and basic character structure following psychotherapy as shown by serial psychologic examinations and clinical evidence of improved ability to recognize and deal with conflict situations.

On August 8, while hospitalized for treatment of her colitis, she was noted to be walking with difficulty. Her speech was slurred. Within an hour, she became comatose, cyanotic and expired. Autopsy revealed the exacerbation of colitis with no perforation and showers of pulmonary emboli in both lower lobes of the lungs. Examination of the head was not performed. It is assumed from the clinical picture that a cerebrovascular accident was the cause of death.

We suggest that our psychotherapeutic approach may be applicable to many patients with severe psychosomatic disease.

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From time to time it would seem wise to use the pages of a scientific journal to communicate to its readers the thoughtful reflections of experienced observers in its fields of specialization. Because of their freedom from the restrictions of the usual scientific communication, such essays can allow great latitude for the expression of considered opinion and unproven hypothesis. One would hope that such presentations would serve to stimulate investigation as well as to clarify problems that constantly arise in handling clinical material. Such is the intent of Dr. Branch's comments on schizophrenia and related problems.

The Editors

SCHIZOPHRENIA AND RELATED PROBLEMS

C. H. HARDIN BRANCH, M.D.[1]

Schizophrenia, as has been repeatedly pointed out, is an uncomfortably all-inclusive word and also an uncomfortably all-inclusive concept. For the very nature of the illness calls to mind a host of problems ranging from the difficulties of accurate diagnosis through the bewildering mazes of accompanying physiological and biochemical phenomena to a whole constellation of social problems. In this last group must be included such matters as the interrelationship between the patient and his family, the cultural values which to some extent determine the treatment of the patient and the hospitalization policies which are influenced by these and other forces.

It obviously cannot lie within the province of this paper to encompass so wide a range. Instead, it is the hope of the writer that some general relationships can be brought into focus.

The clear cut, classical descriptions of schizophrenia, however much we may admire the clinical skills and the descriptive precision which made such categorizations possible, do not touch this wider range of problems. We have not helped matters demonstrably by reminding ourselves that we should speak of "the schizophrenias" rather than of "schizophrenia." And even the present day statements that we are probably lumping together—because they resemble each other symptomatically—a host of basically unrelated conditions have not lead us to any real improvement in treating patients.

The semantic manipulation of trying to use "schizophrening" as a verb describing behavior rather than "schizophrenia" as a noun describing a status may have some slight value. At least, it reminds us that we cannot apply to schizophrenia preventive measures derived from public health analogies. In public health preventive programs we are dealing with a concept which involves a hypothetical "normal" state in the organism which is altered by the introduction of something; prevention consists of destroying the "something" or blocking its attack on the organism. This same procedure cannot apply to a continuing behavioral pattern. Unfortunately, we are operationally as impotent with the verb as with the noun.

In this general connection, one purely speculative thought comes to mind. At one time the "consumptions" were similarly lumped together, and it could be conjectured that since some of the "consumptives" had fatal illnesses attended by hemorrhage from the lungs, a certain dread might extend from this group to include all people who were thin and pale, even though their illnesses might be quite different.

In an analogous way, one wonders if the picture of chronic, hopeless incapacity seen

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in the deteriorated schizophrenic patient does not contribute something to the attitudes displayed when any part of the label is applied to persons. For there can be very little doubt that the word "schizophrenia" carries with it far more than a simple diagnosis. For "consumptions" the earlier connotations included a suggestion of weakness and immorality, a pervasive malign influence and death. For "schizophrenias" the connotations are chronicity, resistance to treatment, social maladaptation and eventual parasitism.

Most attempts to describe schizophrenia do not deal directly with these connotations; rather, they tend to focus on the symptoms or the forces which resulted in the production of the symptoms. Thus we find schizophrenia described as a multi-determined aberrant behavior pattern, a "way of life," a disorder in interpersonal relationships or a genetically determined reaction. The extensive attempts to correlate schizophrenia with various physiological and biochemical phenomena may eventually prove to be fundamental contributions to the problem of separating the schizophrenias into more workable and specific groupings, but at the present time there is no clear cut basis for any hope that we are nearing the heart of the problem. Until we do, and until specific therapies are available, the connotations of schizophrenia—the concentric rings around the unknown core—will continue to be the really troublesome part of the matter.

The work of Bateson and others, describing schizophrenia in terms of a "double-bind" phenomenon, a model which attempts to portray dynamically the disturbed interreaction between the patient and his environment, seems to point in the direction of a social situation which offers the patient no solution other than his illness. And Opler, Singer and others have emphasized the effect of cultural realities in defining various social structures and functions "as these influence normative behavior or psychopathology." These approaches, though perhaps offering little to the treatment of patients as a group, at least seem to emphasize the necessity of approaching schizophrenia on a scale broader than the study of the individual case.

To retrace our steps for a moment, what machinery is set into motion when schizophrenia is given as a diagnosis or is added as a diagnostic possibility in borderline cases, often toward the end of a case conference and usually by the senior consultant present? Operationally, this label brings into the planning for treatment and/or disposition of the patient a flavor of rejection. The responsible therapist is being told, implicitly, that psychotherapy will be difficult if not impossible, because the schizophrene has trouble forming adequate interpersonal relationships. The ward personnel concerned with the patient are being warned that the condition is probably chronic and that the end result may, at best, be an improved adjustment or a remission of the illness rather than a clear cut "cure." Even the choices of therapy reflect something of this attitude, for there is a tendency to turn toward chemotherapy or physical therapies when "schizophrenia" is brought into the picture. Freyhan[2] makes an excellent point in his discussion of Bleuler's statement that "schizophrenia . . . . does not permit a full *restitutio ad integrum*." "The notion of schizophrenia as an entity persists," he says, and "*De facto*, conceptual references continue to be to schizophrenia, not schizophrenias."

In some special cases there is the hint that an individual reaction solves some problems for the group. Kaplan and others, in their work with the Hutterites, have suggested that the appearance of "Anfechtung"—a peculair guilt-ridden depression with strong religious coloring—in an individual is in one way useful to the com-

[2] Freyhan, Fritz A. Eugen Bleuler's Concept of the Group of Schizophrenias at Mid-century. Amer. J. Psych., 114: 769, 1958.

munity since it tends to validate the basic religious dogma that the Devil is a powerful, ever–threatening figure. In families, it is frequently noted that stresses are relieved if an individual can be labelled schizophrenic; the sad corollary of this is that the families unconsciously work against the readmission of the schizophrene to the family group. In a broader perspective, it may be that the ethnic differences reported by Opler and Singer in their comparison of Irish and Italian schizophrenics have their counterparts in the attitudes of the subcultures which, for different reasons labelled these individuals "sick," "different" or "bizarre" and extruded them from the group into the hospital as schizophrenic.

To recapitulate, there seems to be considerable evidence that the concept "schizophrenia" has come to apply to a whole legion of emotional disorders and, as might be expected, the patients to whom the label is applied suffer, as a group, from a general attitude derived from observation of the sickest members. It is even probable that the "sickest members" belong to a different group entirely and that the majority are simply being called "different" or "unconforming" or "unwanted." If this is so, we have a heavy burden of responsibility to see to it that we do not, by indiscriminate labelling, undo much of the destigmatizing which public education has accomplished for the mentally ill.

The important question is whether we have really accomplished a great deal in the direction of destigmatizing the mentally ill. I do not think we have. Undoubtedly we have turned our once–stinking hospitals into clean and respectable places, we have made it possible for a few people to admit having had a mental illness, and we have received public approval of the need for financial support of programs designed to increase appropriations, provide training opportunities and strengthen research budgets. One can neither quarrel with the aims of these activities nor complain about the results. Budgets have been increased, per capita per diem expenditures for hospitalized patients have gone up and there are more available trained personnel.

But there is an uneasiness about the whole affair. There are individual exceptions, of course, but there is still a reluctance to accept completely a discharged psychiatric patient into the community. A person who has had an emotional disturbance may be regarded as *ipso facto* unsuitable for a position, a history of an emotional illness requiring hospitalization carries considerable weight in cases concerning divorce, the custody of children and even competence in general. And, perhaps more significantly, medical insurance plans either exclude mental illnesses or are so restrictive that they are practically useless.

As a supreme example of a social attitude, we have the fact that in some states a mentally ill person, particularly if he is a committed patient, is implicitly, from the moment the diagnosis is made, an indigent patient, since there are quite inadequate provisions for the assumption of financial responsibility by the patient or his family, regardless of their actual financial status. Even when arrangements are available for the patient or his family to pay the costs of hospitalization, the per capita per diem costs are those calculated for the whole state hospital, not those applying to the admission or treatment unit in which the patient is presumably first hospitalized. When the care of the mentally ill is equated with indigency and when the administrative machinery thus tends to draw into a single group the "bad," the "unwanted" and the mentally ill, it is clear that in some of our legal arrangements we have not gone far beyond the Massachusetts law of 1797 dealing with "lunatics" and written as an amendment to the "Act for Suppressing Rogues, Vagabonds, Common Beggars & Other Idle, Disorderly and Lewd Persons."

A further example of our confusion about the whole matter is our continuing to saddle

the state hospitals with so broad a load of psychiatric, and parapsychiatric, problems. These institutions are required to admit and to care for, not only the acute and chronic psychiatric illnesses, but also the unwanted of every kind: the psychotic criminals, the socially ineffective, the aged, the adult mental defectives, etc. The situation persists in spite of our complete professional awareness that these groups require different kinds of personnel, different facilities and different treatment.

Psychiatrists should be leaders in dealing with these confusions and these problems but *as a group* we have failed to assume this position. Granting again the individual exceptions and granting also the fact that our professional organizations are expressing some official concern, the fact still remains that the vast majority of psychiatrists have turned their attention from these problems to outpatient activities and to preoccupation with individual psychopathology. Hospitals continue to be pitifully understaffed, in spite of the fact that salaries are slowly improving, and the poor salaries do not, in themselves, seem to be the chief obstacle to recruitment. Instead, one gets the impression that hospitals have recruitment difficulties because of two main items: the low status of public hospital positions and the administrative red tape which prevents full professional satisfaction.

Administrative entanglements can often be blamed on state or governmental procedures or the practical necessities of politics. No matter how progressive and dedicated the hospital superintendent or manager, he may be helpless in the face of regulations or practices which limit professional travel, practically prohibit postgraduate education, restrict his ability to establish or maintain training programs and discourage research. For the correction of these ills, long, patient public education and pressure will be needed.

But the relative unpopularity of public hospital positions is not all attributable to faulty administrative practices, and some part of the blame must be borne by psychiatrists themselves. Certainly no single person or group can be specifically condemned, but it cannot be denied that we have not sufficiently concerned ourselves with the bulk of the problem of the mental illnesses. No psychiatrist can be criticized for preferring to limit his practice to outpatients, but there is something peculiar in a value system which makes this so frequently the favorite choice. And if this is the value system in psychiatry, we have wandered somewhat from the brotherhood of physicians.

Our concern with individual psychotherapy, particularly with psychoneurotic patients, could be regarded as more legitimately directed at the general problems of the mental illnesses if it could be demonstrated that increasing knowledge of individual psychopathology is resulting in some improvement in hospital treatment procedures and reflected in increased discharge rates. This does not seem to be the case. The major breakthrough in the hospital picture coincided with the wave of popularity of the ataractic drugs and is not demonstrably related to the increased use of psychotherapy. Regardless of the popularity of psychotherapy with both psychiatrists and patients and regardless of its usefulness in individual cases, it has made no significant direct attack on the mass of the total problem.

This is, of course, a sweeping and perhaps illogical conclusion. It certainly is reasoning on the *post hoc, ergo propter hoc* line. Possibly the present improvement in the public hospitals is the result of a group of processes of which the development of the ataractic drugs is only one. But my point is that if we are hiding our heads in the sand we cannot rationalize our position by defending the importance of the study of the individual grains.

Earlier use of the psychiatrist in the community, it is said, results in earlier diagnosis and consequently more efficient

treatment for the hospitalized patient. This is difficult to assay. One gets the impression that patients accept hospitalization somewhat more readily than in previous years, and this is to the good, but the same process can result in the hospitalization of people who would previously have been cared for at home. The overworked staff of the public hospital cannot take full advantage of the opportunities to work intensively with the more acute cases if their machinery is clogged by the sheer mass of a higher admission rate.

The picture is replete with paradoxes. Public education is based on recognition of the plight of the public hospitals but except for increased appropriations has resulted in little improvement of the situation. Psychiatrists are fully aware of the problem but as a group overwhelmingly prefer other kinds of practice. Training centers make sincere efforts to answer the demands for greater numbers of trained personnel but the products of these programs tend to place themselves in practices and in locations far removed from any direct attack on the bulk of the problem. Even the public hospitals, though a part of their difficulties undeniably stems from their anomalous political and social position, do not, in many instances, sufficiently advance their own interests by appropriate liaison operations with communities, clinics and training centers.

The public hospitals merit special attention since they and their patients are at the very center of the whole affair. It would be expected that the administrators and staffs of these institutions would be striving constantly, in every possible way, for improvements in their diagnostic, treatment and follow-up procedures. It is something of a shock to learn that in many instances other matters have higher priority. This is not meant to imply that the responsible persons depreciate the importance of patient care and treatment nor is it meant to imply that these higher priorities are chosen by them. But no one can really devote himself whole-heartedly to clinical activities if—as is often the case—his assigned duties include business management, the maintenance of political relationships, the conciliation of powerful personnel groups and the professional supervision of an institution combining a general hospital with a home for the aged, a school for the mentally defective, a custodial center for chronic mental and physical illnesses, a pseudo-prison and a haven for all sorts of unwanted people. It is greatly to the credit of the public hospital people that they are able to accomplish anything at all.

In such a position, the hospital administrators and his staff cannot be blamed for concentrating on the improvement of the physical plant and the maintenance and even solidification of their existing positions. If these preoccupations are at the expense of progressive treatment procedures and the establishment of adequate training programs, the fault belongs to society rather than to the hospital personnel, but name-calling does not brighten the picture.

It may be premature to expect public hospital personnel to lift their eyes to the broader aspects of the problem. Not more than one or two decades ago patients, almost as a matter of course, had poor housing, poor food and often ill treatment. Even today, the increased appropriations have in many instances been sufficient only to correct previous deficiencies; often they do not permit or encourage progress beyond this point.

Hospital personnel themselves, however, must bear some part of the responsibility for failure to face the issues squarely. No one can safely assume that an attempt to inaugurate changes in a mental health or hospitalization program will inevitably receive full and unqualified support. Even those who could be expected to benefit most from such changes sometimes seem uncomfortable, as though they wished the whole thing would go away and leave them

alone. Sometimes there are understandable mutual suspicions, sometimes there are honest differences of opinion, but sometimes there are more immovable obstructions. A hospital may be controlled by nonprofessional personnel, or hospital personnel may fear the introduction of new procedures and new people, or local policies may be dictated by distant and uninformed boards or offices, or the hospital may, in effect, be a feudal empire in which growth is seen only in terms of acquisition and accretion.

Outpatient mental health clinics, as part of the public mental health programs, deserve some mention even though their role in relation to the public hospitals is far from clear. Presumably they could strengthen, or in some cases actually inaugurate, the follow–up and rehabilitation programs of the hospital and when they are directly a part of the hospital program they provide a desirable link between the hospital and the community. Presumably they would be convenient places for medical supervision of those patients who have been discharged from the hospital and directed to continue their ataractic medication. Both these activities are useful and are directly related to the hospital problem.

In their other activities, however valuable they may be, specific usefulness to the problems of hospitalization of the mentally ill is not so easily demonstrated. As previously stated, these clinics may indirectly increase the number of hospital admissions, and they certainly attract an indeterminate number of patients who had previously stayed afloat by clutching at various social agencies. Once the mental hygiene clinic is established, these individuals clamber aboard the raft of psychotherapy, or are pushed there by the other social agencies in the community. These or similar processes result in the assumption of responsibility, willy–nilly, by the mental hygiene clinic for patients who are now labelled "psychiatric" whereas previously they were labelled "social" problems. Perhaps this is a legitimate evolutionary development, but it certainly limits the amount of clinic time available for more clear cut psychotherapeutic activities. And the inevitable result is an increase in the number of people who are potentially the responsibility of the public psychiatric hospital.

Here, then, is another paradox: with the hope of developing a treatment and prevention program, we actually create, by redefining, a new group of psychiatric problems. To this should be added other groups which are similarly created: the people with unrealistic expectations that psychotherapy will magically remove all worries and fears, the people previously sheltered by reluctant families who now find the presence of the clinic a good excuse for overt rejection, and all the borderline medico–legal cases. Whatever may be the long–range usefulness of such clinics—and, fortunately, there are the many grateful individuals whom the clinics have significantly helped—their specific value in relation to the hospital programs has yet to be demonstrated.

One is forced to suspect, in the face of these confused pictures of activities in the mental health field, that there are forces and feelings working counter to our expressed aims. The more obvious can be identified as public apathy, political inertia, administrative policies which are both outdated and penurious and, perhaps, the tendency of professional people to defend their rugged individualism. But it has been suggested by Rudolph Kieve (in his Chairman's report to the Executive Committee of the Western Mental Health Council) that we tend to underestimate the power of the basic fear of the mentally ill, which is part of our social matrix. It is this same element which was previously mentioned as (perhaps) stemming from the public—and, unfortunately, the professional—attitude toward schizophrenia. Kieve feels that "... (we must) take cognizance of the hard core

public opposition against large-scale mental hospital measures that goes hand-in-hand with an abashed lip-service in behalf of the occupant of every other hospital bed."

He goes on to comment that the roots of psychiatric hospitalization lie, not in medicine but in the penal system. The duty of the alienist was to protect society, not to heal the sick, and though we have now added a treatment responsibility to the more traditional burdens, we insist that he (the public hospital psychiatrist) continue to function as a sort of gaoler. It is not without significance that procedures for the court commitment of patients, and for the sentencing of criminals are structurally very much alike. We can hope, with some justification, that there is a conceptual dissimilarity, and perhaps we can measure our progress by the amount of our movement toward a medical and away from a penal orientation.

At this point, one is tempted to say, like the psychiatrist to his patient in the well-known cartoon, "I'd like to help you, but, as you say, it all seems so hopeless." But the picture is not all bleak. The writer would be the first to admit that there are many individual exceptions to the rather discouraging situations outlined in the preceding paragraphs, and there are encouraging signs that new approaches may be forthcoming.

In my opinion the most important new approach will come primarily through administrative channels. Ideally, the energizers should be the psychiatrist-administrators, but it is highly probable that public-spirited citizens, with professional guidance and consultation will provide the real power for the sweeping changes required. The problem, as now structured, involves so many social and political strata that is is unlikely that any one specialist in the mental health field could attack on a sufficiently broad front.

Fortunately the wide spread use of the ataractic drugs provide a setting in which sweeping changes can be made. Whether or not the increased optimism derives from actual improvement in patients is immaterial; the significant point is that the optimism exists and is felt by hospital attendants, patients' families, non-psychiatrist physicians, hospital administrators and legislators alike. This feeling of confidence makes a change in the ward atmosphere within the hospital, is sufficiently reassuring to communities to permit earlier discharges and an extension of outpatient management, and will make possible a wider use of general hospital facilities. It is in the correlation of these activities and a consolidation and expansion of these gains that progressive administrative leadership can—and must—play the most significant role.

Some machinery already exists. For example, the state laws which encourage community participation by matching local with state funds will provide effective tools. In some states, *e.g.*, Kansas, there has been a serious attempt to improve the situation by all-out encouragement of existing facilities. And in areas where intra-state facilities are somewhat limited, the creation of such inter-state organizations as the Southern Regional Education Board and, more recently, the Western Mental Health Council of the Western Interstate Commission for Higher Education, provides a medium which can initially be used to facilitate the sharing of information and may eventually lead to the establishment of treatment facilities and training and research institutes which can contribute effectively to two or more states.

It is not necessary, however, to wait until long range plans can be implemented. Within each state, each hospital, each community, there can be serious immediate consideration of possible administrative changes designed to make optimal use of existing facilities. As one example, a state could, by suitable administrative manipulations, effect adequate continuing liaison operations between training programs and public hospitals and decentralize state hospital operations by estab-

lishing psychiatric units in general hospitals and making appropriate use of psychiatrists in private practice. At the same time, the hospital part of the state hospital could be moved toward the medical side by divorcing from it the units dealing solely with custodial problems and by combining the units designed for rehabilitation with other state institutions also dedicated to rehabilitation. The financing of the care of mentally ill patients could be made more efficient, more consistent with the financial state of the patient and his family and at the same time more respectable if the state would encourage medical insurance plans to provide broader coverage for psychiatric patients. Even if this required a subsidy, the plan would protect the patient from the ignominy of being essentially a public charge, would encourage the development of psychiatric units in private general hospitals and would reserve complete state financial responsibility for those patients who were in fact indigent and for the patients whose illnesses were so chronic that no family could stand the long continued strain.

Plans such as these would encounter a host of objections, some valid, others not. The point at issue is not the validity of the specific plan but rather the practicability of allowing optimal use of existing facilities by administrative manipulation alone. At the very least such a program would allow us to find out what we could do now if our existing skills were used to their utmost, without the necessity of waiting until someone discovers the mythical "cure for mental illness."

Even within a hospital, administrative changes alone could secure postgraduate education, improve in-service training programs, encourage professional travel and provide for research space and personnel. Again, it is not the point that these things may or may not aid in the treatment of the mentally ill. If they have value at all, they can be obtained now, and by administrative changes alone.

All this may seem only distantly related to the schizophrenia which was the initial topic. Perhaps it is, but there is some evidence that both professional and lay persons interested in the mental health field view the total problem with an attitude strongly colored by the original fatalistic approach to schizophrenia. If this is not true, we must make every practicable effort to deal specifically and concretely with whatever we can, to narrow the areas of our concern so that we can concentrate our efforts more efficiently and, without relinquishing our attempts at more exquisite categorization and the determination of fundamental etiologies, to see to it that all patients actually get the very best of what we already have to give.

WHAT DO SCHIZOPHRENICS LEARN DURING PSYCHOTHERAPY AND HOW DO THEY LEARN IT?[1]

EUGENE B. BRODY, M.D.[2]

Perhaps it would be more relevant to ask: why does working with schizophrenics bring out our urge to theorize? Lack of knowledge alone cannot account for this. The schizophrenic patient poses a special challenge to therapists, part of which is expressed in the frequent concern with seeing the person behind the symptoms. This perception of an imprisoned, fearful person, so needful of help and yet so resistant to it, creates, I think, an atmosphere in which semi-mystical explanations are more attractive than usual. The therapist's strong, often frustrated, urge to help and the occasionally miraculous result of a seemingly trivial intervention increase his tendency to construct highly personal theories about the illness. Finally, there is the observation that certain persons can achieve unusual therapeutic results with their patients. Gertrude Schwing (8) is said to be one of these. Possessed of a sense of mission, a powerful wish to cure, she has been described as emanating an aura of strength and hopefulness. Recently, Mabel Cohen (4) has referred to the freshness, the energy, the whole-hearted belief, and the dedication of beginning residents which seem therapeutically more effective with schizophrenics than the theoretical and practical know-how which is developed later through instruction. She condensed these elements into a "faith factor" which might be subjected to systematic study. Certainly, it is premature to expect great precision in dealing with psychotherapeutic matters. Demands for certain and unvarying explanations of human behavior still remind me of Bertrand Russell's comment, "When a man tells you that he knows the exact truth about anything, you are safe in inferring that he in an inexact man."

I have, so far, leaned heavily on Freudian theory in my attempts to make sense from what I have observed. In the present discussion I will try to combine some ideas from psychoanalysis with others from learning theory as they seem pertinent to the treatment of schizophrenia. Our concern is not so much with how to "cure" schizophrenic patients, as it is with how to understand the changes in their behavior during psychotherapy. In the pursuit of this understanding we will touch upon several topics. These include character change in relation to learning, the psychotherapeutic situation as a special millieu for schizophrenic patients, the acquisition of specific in place of general behavioral responses, and insight and reinforcement learning.

By "learning" I mean the acquiring of new responses and—what is most important in psychotherapy—the relinquishing of old ones which are ingrained but maladaptive. With particular reference to the schizophrenic patient, what are the factors which interfere with, or, on the other hand, make easier, the development of new and useful behavior patterns? The patients who supply the data for our discussion are largely confined to a particular group: educated, intelligent, and upper-middle class. They communicate verbally, are still critical of their delusional and hallucinatory experiences, and sufficiently uncomfortable to want help. My remarks will, accordingly,

[1] This paper was prepared for the conference on psychotherapy with schizophrenics at the Southeast Louisiana Hospital, Mandeville, Louisiana, February, 1958. It has been presented at meetings of the Maryland Psychiatric Association, March, 1958, and Chestnut Lodge Research Institute Staff, April, 1958.

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refer to a group of patients who have many advantages.

CHARACTER CHANGE AND LEARNING IN RELATION TO SCHIZOPHRENIA

Let us first examine the way in which character may interfere with new learning. The term 'character' refers to an individual's usual ways of thinking, feeling, and acting; *i.e.*, it refers to a set of responses. The idea of a usual or customary way of behaving implies a response hierarchy. Taking all the contexts in which a person operates, certain responses are more likely to occur than others. Similarly, certain responses are less likely to occur. It follows that the stability of this response organization may interfere with the acquisition of new ways of behaving.

What factors contribute to the stability of the response organization we are labelling as "character"? A frequently used psychoanalytic idea is that the organization of character reflects a compromise between the pressures of the inner drives, the claims of the superego, and the demands of reality. This compromise probably always involves some limitation of various ego–functions which permits gratification of certain wishes and reduces conflict. The impaired ego–functions include, among others, those involved in critical self–observation and the delay of wish–fulfillment. We have, then, a tentative formulation of character as an organization of responses with a high probability of occurrence which gratify certain wishes and simultaneously satisfy some superego requirements. Characteristic behavior is more likely to occur because it is triggered off by relatively low degrees of tension, anxiety, guilt, or discomfort. The response organization is stable because it is tension–reducing; it allows the relatively comfortable occurrence of wish–gratifying behavior even though it may not be adaptive (3).

If minor increases in tension always result in discharge behavior the need to discover new responses is reduced. This may become a problem in psychotherapy as the patient becomes aware of poorly tolerated aspects of himself, or begins to suffer from ungratified desires regarding the therapist. He may deal with his anxiety or guilt through wish–fulfilling or defensive action, fantasy, or dream, or by developing delusions or hallucinations. The psychotherapeutic hope, of course, is that increased tension will have the opposite result: it will motivate the acquisition of more, rather than less, adaptive responses. In the presence of unusual stress, the components of the response pattern may become intensified with greater adaptive impairment, or, if the old responses become unable to handle the accumulating tension, "new", more pathological, *e.g.*, psychotic, responses may be used. I put the word "new" in quotation marks to recognize the possibility that the psychotic responses may be new only in the sense of identifiable operations, and that they may have been always potentially present as the less probable behaviors in a response hierarchy.

When tension–reducing behavior involves a marked impairment of the patient's ability to appreciate reality, or when he replaces reality with a psychological construct of his own, then we are faced with a diagnostic problem.

The following example suggests a possible continuum between *a stable, reality–oriented pattern of deviant behavior* and a psychotic way of reacting to stress:

A man began psychotherapy because of a realistic fear that his behavior would result in his apprehension by the police. He would encourage boys to engage in sadistic games and would achieve orgasm while watching them. After several months he told me of developing masochistic fantasies in which I played the active punishing role. During this phase of treatment there appeared a newspaper article describing the apprehension of a man for pederasty. The patient confessed a strong belief—concerning which some critical uneasiness remained—that I had planted the article to test his reactions, and as a kind of warning to him.

This belief did not persist, nor did it recur during the ensuing two years of treatment. During this time he carried on his work in spite of a vaguely paranoid outlook and much hostility against administrative superiors. The transient delusional idea eventually became clear as a disguised fulfillment of wishes to be punished by me, and more pertinently, as an expression of the wish that I would interrupt the dangerous development of his sexual interest in me.

How might masochistic fantasies progress to psychotic behavior in this man, who is so hostile and sensitive to authority? Bak (1) has suggested that paranoia, ideas of persecution, can be understood as the delusional gratification of masochistic wishes. Bak's idea is based on Freud's opinion that people with masochistic beating fantasies become particularly sensitive toward, and allow themselves to be easily offended by, persons whom they can put in the *class* of fathers. In this way they may bring about the realization of the imagined situation of being beaten by their father. "I would not be surprised," wrote Freud, "if it were one day possible to prove that the same fantasy is the basis of the delusional litigiousness of paranoia." (6)

How does psychotherapy interfere with the progression to paranoia? One possibility is that it facilitates tension discharge within the transference relationship and thus helps to maintain the stability of the intrapsychic compromise. Perhaps we can think of this as a way of interfering with the acquisition of new, more pathological responses. Another possibility is that psychotherapy will help the patient to respond to individuals as specific persons rather than as members of a class, *e.g.*, fathers. We will return to both of these points later.

The following illustrates the kind of change which may occur in characteristic, non–psychotic behavior patterns, such as social withdrawal, during psychotherapy in the course of a schizophrenic illness.

After several months of hospitalization, a young man was preparing to return to his work, but to continue treatment as an outpatient. Prior to his acute illness, he had been known as pleasant, although very shy and reserved. He said he felt now much like his old self. Then, with a slightly embarrassed smile, he said that he could think of nothing to say. A moment or two later, he told of having patched up a quarrel between two other patients, Phyllis and Bob: "They thanked me for what I had done. But when they had gone, I felt lonely and deserted. When Bob first became interested in Phyllis, I was upset—I guess I saw it as a threat to our own friendship. Bob is one of the first real friends I have ever made. When they broke up I felt sort of triumphant. And now look what I've done. I've nipped myself in the bud. I'm afraid of pulling back into the old lone wolf role; that was normality, that was it, my whole life, just me. Maybe that's why I couldn't think of anything to say to you a while ago. I never could talk before I came to the hospital. I couldn't turn anything loose. I'd just pack it in and let it boil."

This man apparently had succeeded for a long time in keeping his internal tension at a manageable level by avoiding close contact with other people. Perhaps his psychosis, if allowed to proceed unchecked, would have eventuated in still more marked withdrawal.

All schizophrenic people do not, however, rely on isolation in order to survive. Some have been able to maintain relative stability because they live in particular situations. We might think of such a situation in terms of the previous discussion, as one which permits regular tension reduction by gratifying certain needs and allowing relative freedom of action in a protected environment. Such tension reduction may keep intrapsychic conflict at a manageable level in a manner similar to the character disorders. In this case there is little need, either to utilize more pathological conflict solutions, or to acquire more adaptive responses.

The following example is that of a woman whose marital relationship allowed her a regular aggressive discharge with the associated gratification of some libidinal needs over the years of her psychosis:

At the age of 30, she had suffered an acute psychosis with auditory hallucinations and repeated suicidal attempts for which she was hospitalized

following childbirth. Her acute disturbance did not recur, but for the next 36 years she reported the receipt of telepathic messages and had many delusional ideas about her husband's fidelity, often berating him severely. Much of her daily behavior was determined by her delusional ideas; she made obvious efforts to regulate her husband's life, and seemed to derive much gratification from her chronic spying on him. He not only allowed this, but cared assiduously for her needs and resisted the demands of the community that she be hospitalized.

THE PSYCHOTHERAPEUTIC SITUATION AS A SPECIAL MILIEU

The psychotherapeutic situation may also permit the schizophrenic to gratify some of his most urgent needs in relation to a single person or a circumscribed area of life. These circumstances permit him to behave acceptably with other people. Initially the patient's needs may be expressed in the familiar transference psychosis. The doctor becomes the focus of the fantasies and delusions of the disturbed patient, and reduces his need for other involvement. The resistance of this transference to adequate resolution may account for the importance to the patient of keeping in touch with his doctor after treatment is terminated.

The persistence of some aspects of the transference psychosis may be illustrated by the case of a woman who, in her middle thirties, was hospitalized during an acute paranoid schizophrenia. Four previous episodes had been treated with electroshock. During several months of intensive psychotherapy she gradually reorganized her perception of the world with me as the major constant figure; then, as she was able to see me in more realistic perspective, she was released from the hospital and continued as an outpatient. In recent years, we have exchanged only an occasional telephone call or letter. Although her behavior is socially acceptable, and in the eyes of those around her she is not psychotic, she still has "the whispers." These may occur when she is unusually tired, when she feels more than usually rejected by her husband, when her children, who are rapidly growing up, seem farther away from her than usual, or in the face of other situations which evoke a feeling of being lonely, separate, unimportant, or futile. "The whispers" consist of my voice, whispering over and over again, "I love you; I love you..." She knows that I am not there; she does not try to evoke them as one might a pleasurable fantasy; even after repeated experience, their onset is still unexpected. She has said rather wistfully that she knows that they are hallucinations, or something like that, but that while they are going on they seem real and when they are over she feels better.

This case seems to demonstrate the transference element which is important in many successfully treated schizophrenics. It also calls to mind some remarks by Harry Stack Sullivan (9) in 1930. He spoke of patients who had learned enough "to realize the prejudice opposed to their delusions. It seemed almost as if they grew wise enough to be tolerant of the imbecility surrounding them, having finally discovered that it was stupidity and not malice. They could then secure satisfaction from contact with others, while discharging a part of their cravings by psychotic means." I do not propose to discuss the question of training patients to keep their delusions to themselves; the discovery that it is stupidity, and not malice, which surrounds them implies a development of the ability to discriminate and differentiate, and I will refer to this later.

The example of the patient with the "whispers" suggests that it may be the job of the therapist to make it possible for the patient, in Sullivan's words, to discharge part of his cravings by psychotic means. This involves not so much imposing a treatment upon the schizophrenic as making one's self available to be used by him. The patient's use of the doctor is reflected first in the transference psychosis and later in its residuals. Many prescriptions for the psychotherapy of schizophrenics may be summarized under the heading, "how to go about making yourself into someone who is available to the patient." The process during which the patient begins to perceive the therapist as available involves the acquisition of new responses. The patient's learning *about* his therapist seems essential to the development of the transference psychosis, as it is ultimately to his ability to

respond to him as an interested helper rather than as representative or symbolic of other kinds of people. That is, the patient tends at first to deal with the therapist as a member of a class, because for all sorts of reasons he cannot allow himself to know anything about him as an individual. The members of this class may perhaps be best subsumed under Milton Wexler's description of the nucleus of the superego: "the internalized parental figures dressed in the variable garb of one's childhood mythology" (10, p. 246).

The tremendous emphasis in the literature on the desirable personal attributes of the therapist of schizophrenics recognizes, I think, the importance to the patient of learning *about* the therapist. Sometimes fortuitous circumstance is unexpectedly helpful in this regard.

For example, a psychiatrist told me recently of a seemingly remote, cold patient who suddenly behaved in a warm, friendly, sympathetic manner. What was the occasion? The doctor had just returned from a visit to the dentist; her jaw was a bit swollen, and her face revealed some discomfort. The patient remarked with evident gratification—but without apparent hostility—that he could tell where she had been, and that he knew how it felt.

What have we here? First, there is the element of shared experience—the patient discovers with pleasure and relief that he and his doctor have some community of experience. The consequences of such a discovery are surely important for therapy. Psychoanalytic theory suggests that this kind of discovery makes of the doctor a more suitable object for identification; *i.e.*, it facilitates the acquisition by the patient of some of the doctor's ways of behaving. Thus, the relationship with the doctor is considered as a bridge to reality; to relationships with other people. The psychoanalytic theory of identification at the primitive level also implies incorporation of the image of the therapist; this image may ultimately replace other internal images, such as that of the mother, which plays a dominant role in the control of the patient's behavior.

Let us now abandon this theory for the moment, and instead of invoking the concept of identification we will think of this discovery of common experience in another way, as a necessary step in the acquisition of responses which are appropriate to the relationship with the doctor. This is part of learning about him, and learning to differentiate him from others. In a broad sense, the discovery may be classed as a process of insight[3]; the patient perceives a connection between the doctor and himself.

INITIAL INSIGHT LEARNING DURING THERAPY. A general hypothesis, then, may be stated as follows: the schizophrenic's initial learning during psychotherapy is the acquisition of a perceptual response; this is the perception of his similarity to the doctor. The acquisition of this new response requires the abandonment of an older one: the perception of the doctor as a member of a class of dangerous, rejecting, or indifferent people. Another way of putting this is that the patient no longer sees the doctor as a symbol of his past experiences with members of this class. The new connection, which I am calling insight, is one which the patient makes between his experience of the doctor, and his experience of himself.

LEARNING HOW TO BEHAVE SPECIFICALLY AND APPROPRIATELY RATHER THAN GENERALLY AND INAPPROPRIATELY. The development of this insight may be the beginning of a shift away from generalized responses toward those more specific and differentiated. We are accustomed to thinking of the generalized responses of the schizophrenic as ego-defensive. His behavior reflects his attempt to deal with disturbing thoughts and feelings evoked by others, or to avoid close contact with them. These responses elicited by others may be characterized as over-

[3] For a discussion of the nature of insight, see Reid, J. and Finesinger, J., The role of insight in psychotherapy. Am. J. Psychiat., **108**: 726–734. 1952.

sensitive, anxiously alert, and basically suspicious.

A shift from general to more specific and appropriate ways of responding occurs during psychotherapy with non–schizophrenic patients as well. Psychoanalytically, we speak of changes in transference and in the tendency to repetition–compulsion. French (5) has discussed the major therapeutic task of analysis as "working through" the repressed memory that is being compulsively relived in the transference. The essential feature of working through is reality–testing in which the therapist tries to help the patient distinguish between the past events that he is reliving and the reality of his present situation. French notes particularly the relationship between reality–testing in the therapeutic process and discriminatory learning in rational behavior. Discriminatory learning is defined as the modification of an earlier behavior pattern to take account of differences between present and past.

The following examples may illustrate the schizophrenic's problem in acquiring specific responses. They are from the treatment of the same patient. The behavior in the first example is not clearly psychotic; in the second, it is.

As the patient, whom I shall call J., came down the hall to my office, he saw me talking with another doctor. He did not reply to my greeting, but, staring at the floor, continued at his usual hurried pace. Early in the hour, I commented on his behavior. He said that he hadn't wished to interfere with what I was doing. Toward the end of the hour, without further reference to this event, he recalled some early experience with his father, a cold, driving personality who pressed him to achievements which he did not wish for himself. When J. was six years old, his father agreed to give him a watch if he learned to tell time. After some effort he learned and was duly presented with the watch. On the next day his father was talking to another man; the patient could not restrain his wish to interrupt their conversation and exhibit his watch. Father was impressively angry, and excluded J. from the room. "He never likes anything to interfere with him," J. said. Here I wondered if I should silently accept the implication that he was in fact learning something about his behavior with me in the hall. I decided not to leave this to chance and to be explicit. Therefore, I said that it was hard for him to learn that I was not his father.

This anecdote and the one to follow may assume more significance in the context of a pattern of psychotic withdrawal that had already become sufficiently clear during the course of therapy for J. to talk about it. The withdrawn periods were gradual in onset—he often had the feeling of hanging on the edge for several hours—and varied from a few hours to several days in length. They were characterized by marked motor and verbal retardation, a feeling of heaviness, paralysis, distance from people, and certain characteristic vivid fantasies which were often reported as visual hallucinations, although he could usually identify them as symptoms. During interviews he would hear my voice as though it were emerging from a radio. The touch of my hand on his shoulder, however, was acutely sensed with a feeling of gratitude. After one such episode he spoke of his response to my touch as being that of a baby, for whom only tactile stimuli were meaningful.

We were finally able to identify an apparent precipitating factor present at the time of onset of most, although not all, episodes. (I emphasize this because withdrawal responses clearly occurred in the face of certain other situations as well.) This factor was his perception in me of some element of his father's pressure for achievement and need to use him vicariously to gratify his own wishes. The common element was usually revealed when I spoke of his leaving the hospital, his apparent improvement, his future professional plans, and so forth.

The following situation occurred about two weeks after the encounter in the hall:

J. remarked that he thought he should leave the hospital before the end of the month. He then pressed me hard for a directive. I tried to get across the idea that this should be his decision,

not mine, and that my personal ambitions did not require his immediate return to work. Somewhere in the course of this conversation, however, I put my foot in it, without realizing I was doing so. In the context of his ruminations about how it might feel to have an episode outside of the security of the hospital, he inserted a casual question: had I ever treated patients as sick as he outside of hospitals? Unthinking, I gave a casual reply, loaded with considerable narcissistic freight. Yes, I had treated patients who were even sicker. The next afternoon he greeted me with a friendly smile. He couldn't figure me out, he said. First I seemed to want him out of the hospital; then, when he suggested that he should leave, I didn't seem enthusiastic. Later he was more explicit, comparing the situation with that of a schoolboy offering his teacher an apple which she didn't want. This gave me a chance to recognize his feeling that his wish to leave the hospital was a gift to me—it was something that I had wanted for myself, not for him. This feeling had not previously been so explicit that we could label it. It was only after we talked about the apple-for-the-teacher idea that he told me of the events following the preceding hour. He had felt nervous, confused, foggy, paralyzed. In the night he heard his father's voice calling his name. Later he became convinced that his father was in town and that he had to leave the hospital immediately. This morning he began to think that he should break his appointment with me. The belief that his father was in town merged with an unclear feeling that his father and I were actually the same person. It was only an hour or so before our appointment that he began, he said, to "wake up" from this episode. Looking back, it seemed strange that he should have believed his father to be here, but, he said "if you had asked me then, I thought it was the gospel truth." After some discussion he identified my remark about having treated sicker patients as an important one—except that he didn't hear it that way. He had heard me saying, "you are not sick enough to remain in the hospital."

This episode illustrates how, given the opportunity to do so, the patient responded to me as though I were his father. The patient carried this process a step further than the neurotic usually does. He developed the belief that his father was actually present, and then merged his perceptions of father and me into one. Instead of distorting reality he replaced it completely with a belief which almost permitted him to escape treatment.

This anecdote has many implications which might be discussed in terms of the tactics of psychotherapy. One ubiquitous element to which we have referred is present in all psychotherapy, but in my opinion more marked in working with psychotics. This is the disturbing influence upon the patient of his perception of the narcissistic gain which the doctor may derive from his therapeutic success. In this instance, I gradually became aware of the fact that I did, indeed, want to restore J. to his professional life with undue rapidity, and that I was behaving more like his father than I cared to realize. I think that my communication to J. of this insight about myself, which took some time, was necessary to his ultimate abandonment of the catatonic response.

A second implication of the anecdote about J. is the importance of the therapist's recognition that his patient is *indeed* sick.[4] A therapist who denies the extent of his patient's illness is in effect demonstrating his anxious inability to tolerate mental illness. When I emphasized his improvement, it meant to J. that I did not want to recognize how sick he really was. It was as important that I should remember his underlying anxiety when he was improved as it was that I had been able to accept him at his worst.

Once, in speaking of a withdrawn episode, he remarked on the obvious apprehension of a student nurse on the ward. He said, "I was right on the edge, sort of hanging on; I knew what was coming and I was trying to hold it off. It must have shown in my face, because she kept asking me what was wrong, and I couldn't say anything. She looked worried. Instead of helping me, that pushed me over. I don't know what I would do if you ever seemed that way. That's one of the things that helps me. You seem so calm. If *you* ever get upset by me, that would really shake me."

REINFORCEMENT LEARNING. The newly ac-

[4] For a discussion of this problem, see Dugan, J. B., One aspect of the psychotic episode in the psychotherapy of schizophrenic patients. Psychiatry, **20**: 177–180, 1957.

quired response which is most impressive in these situations is that of self–scrutiny, the patient's ability to look at and think about himself *without getting panicky.* What are the conditions necessary for the acquisition of this response pattern? Tentatively, I suggest that the major condition is the therapist's anxiety–reducing behavior. With respect to J. there seemed to be at least two types of therapist behavior which reduced his anxiety, or, in other words, provided a context in which his experience could reinforce the acquisition of the self–analytic response. One was the therapist's ability to tolerate J.'s disturbed behavior; another was the therapist's ability to tell him of some possibly anxiety–provoking observations about himself.

In this instance the connection between a description in terms of reinforcement theory is close to one in terms of insight theory. The patient's observation of the therapist's self–analytic behavior may have made it easier for him to establish a similarity of experience; his developing insight into their mutual humanity seemed necessary for him to begin to respond to the therapist as an individual rather than as a member of a class. In the same way, perhaps, my acceptance of the accusation implicit in his apple–for–the–teacher idea made it possible for him to tell me of his psychotic experience. This kind of self–recognition and acceptance, so completely different from his experience with father, was, after all, the kind of thing for which he was striving in himself. Conversely, his earlier perception of similar elements in his father and me had confirmed his tendency to respond to me as a symbol of the class of fathers, and had been followed by psychotic retreat. Limitation of space does not here allow a discussion of the significance for the patient's concept of himself of learning to respond to me as a specific individual. One can only refer to Menander's observation: "In many ways the saying, 'know thyself,' is not well said. It were more practical to say 'know other people'."

Finally, let us return to the theory of reinforcement which states that responses tend to become acquired insofar as they are tension or anxiety *reducing.* We spoke first of the therapist's behavior as a necessary *condition* for anxiety–reduction in the patient, to which we may add that all kinds of specific tension–reducing gratifications are inherent in the doctor–patient process.

As treatment progresses we can more easily identify the reinforcing experiences in the patient himself.

J. became able, after a time, to detect the prodromata of a catatonic episode. He then discovered that if he examined the situation and came to some conclusion about what might be triggering off the episode, he was able on an increasing number of occasions to prevent its occurrence. His manipulation of his symptoms was also aided by his attempts to understand the function of the catatonic state. In some instances, it could be understood simply as a retreat from disturbing stimulation; in others, the oral content of the fantasy–hallucinations during very retarded states was understood directly by the patient as similar to his masturbation fantasies.

Success in staving off the occurrence of episodes was itself reinforcing and promoted the acquisition of the self–analytic response. J.'s discovery that he was no longer so much at the mercy of inner and outer events had a profoundly reassuring effect upon him. A successful self–analytic response, then, precludes to some degree the need for other methods of reducing anxiety. These other methods are reflected in catatonic withdrawal and the construction of paranoid systems which make sense out of incoherent perceptions and defend against disturbing thoughts and feelings. Another way of saying this is that with an increase in the number of responses available to the patient, it is less necessary for him to employ those low in the response hierarchy.

An experience of insight can also be reinforcing. J. spoke on several occasions of the pleasurable tension–reducing feeling of

illumination when he became able to understand the possible connections between items in his train of thought during therapeutic hours. In those instances where the therapist's remarks helped him to understand connections, the process of actively paying attention to the doctor was tension–reducing. This is a type of approach response acquired during treatment which may replace less adaptive avoidance behavior.

Perhaps we may summarize many of the responses acquired during therapy as *approach* in contrast to avoidance behavior. These include communication with the therapist, activly paying attention to him, expressing thoughts and feelings, coming to interviews and so forth. The other category to which we have already referred includes those responses which may substitute for impulsive need gratification, or panic. Some of these are thinking, introspection, attempts at manipulating one's symptoms, and social behavior which increases the patient's perceptual input. In other words, therapy results in the acquisition or strengthening of alternative or competing responses. Again, this point of view does not require the assumption of cure, or of a final disappearance of psychotic ways of behaving. It suggests only that psychotherapy can result in a significant reduction in the probability that they will occur.

It may not be justifiable to assume that conventionally drive–reducing or tension–reducing responses actually have such effects for schizophrenic patients. Behavior that we might expect to be anxiety–reducing may result in increased guilt, shame, or anxiety. Psychoanalytic theory postulates a destructive superego at the basis of this. Wexler (10) believed the major task of the therapist of schizophrenics to be the replacement of this superego with a constant "mental image" of himself. He felt that he accomplished this with his patient, Nedda, through the adoption of an authoritarian attitude and speaking the language of her superego. Bak (2) considered Wexler's most significant action, however, to be his consistent agreement with Nedda in her self–condemnations and other feelings, making it possible for him to represent a narcissistic object, *i.e.*, one appearing to her as a part of herself.

There is an obvious similarity between the idea that a narcissistic object choice is essential to the schizophrenic's ultimate development of relationships with other people, and the idea that a crucial insight in treatment is the patient's perception of his similarity to or identity with, the doctor. We may also add that men feel rational (and self–confident) in so far as they meet with *agreement*—which, as Santayana said, is a "form of friendship." The interesting issue with regard to reinforcement is how the relationship with the therapist influences what is tension–reducing for the patient. I am not sure that it is theoretically consistent to think of the superego, which is a developmental concept, as something replaceable by an internalized therapist. It does not seem unreasonable, however, to assume that a relationship with another person will ultimately result in a modification of behavioral standards, and that the modified standards will be those which make sense in the new relationship.

LATER INSIGHT LEARNING DURING PSYCHOTHERAPY. It has already been indicated that psychotherapy is concerned less with events *per se* than with their meaning for the patient. An event which might be expected to be rewarding may actually signify a punishment or a threat. The messages which patients give us about events, internal and external, current and historical, come in sign and symbol form. As treatment progresses and resistances are overcome, there is increasing clarity and diminishing distortion in the patient's representation—in action and emotion as well as in words—of internal and external events. These events include basic sources of conflict, anxiety, and guilt; they also include reality experi-

ences which have confirmed and thus crystallized infantile fantasies. I suggest that the progressive clarity of representation and of communication to the therapist is a manifestation of developing insight. This is a later process than that involving the perception of communality between patient and therapist. The gradual clarifying and organizing of ideas and feelings shown in more precise communication does not reflect so much the perception of bonds between cause and effect, or means and ends, as between symbols or signs and what they stand for. Further, we may assume that in many instances the constellation of experiences (made up of objects, relations, and emotions, both designated and expressed) to which the symbol or sign refers, and which can now be identified, was originally preconscious, or at least on the periphery of awareness. This process of insight, which is a matter of becoming more clearly aware of what one is talking about, may be quite important for the therapy of schizophrenics, in view of their tendency to use words as though they were actual objects. It has, I think, at least three separate consequences.

First, it helps to specify what is tension–reducing for a given patient, *i.e.*, what responses may be reinforced during therapy.

Second, the development of insight facilitates the progressive exploration of the patient's fantasy systems. Glover (7), speaking of the analysis of psychoneurotics, has pointed out that the greater the number of unconscious fantasy systems we discover, the more efficiently can we prevent defensive displacement and the occurrence of substitutive symptoms.

Third, the development of insight reduces the possibility of using wish–fulfilling fantasies for the purpose of tension reduction and pushes the patient into real life activity. That is, it requires him to engage in additional learning in his search for sources of satisfaction.

SUMMARY

The ability to acquire new, more adaptive responses, or the need to utilize new, more pathological conflict solutions is related to the rigidity or stability of behavior; this may be understood in terms of character and of environment.

Character is discussed as an organization of responses which reflects an intrapsychic compromise, *i.e.*, simultaneously gratifies some wishes and satisfies some superego requirements. These responses:

1. are tension reducing,
2. are evoked by low degrees of tension so that they have a high probability of occurrence,
3. may change in some respects during psychotherapy in the course of a schizophrenic illness having been previously useful in keeping internal tension at a manageable level, *e.g.*, by avoiding close contact with others, and
4. may include, in some individuals, occasional psychotic responses occurring in situations of unusual stress (where other responses are not tension reducing); psychotic behavior for most people includes the less probable behaviors in the response hierarchy.

An environment which permits regular tension reduction may also promote behavioral stability in schizophrenics.

The psychotherapeutic situation is one which can provide some need gratification for the schizophrenic patient. This may become apparent in the development of a transference psychosis. The therapist must become available to the patient. The patient begins by learning *about* the therapist. Initially he deals with him as a symbol, a representative of a class of (frightening, rejecting, indifferent) people. Ultimately, he learns to deal with him as an individual. This is made possible by the discovery of common experience with the therapist, the establishment of a connection (the 'initial insight') between the patient's experience of the doctor and his experience of himself.

This involves the acquisition of a new perceptual response (of his similarity to the doctor) and the abandonment of an old one (of the doctor as a symbol of unavailable people). This is the beginning of a shift from generalized to specific and differentiated social (interpersonal) behavior. The achievement of this aim requires that the doctor identify and analyze certain determinants of his own behavior with the patient of which he is not initially aware. Two prominent and related elements are the narcissistic gain which he may derive from 'curing' (often prematurely) the patient, and his inability to tolerate the patient's psychosis.

Many of the responses acquired during psychotherapy may be thought of as alternative to or competing with the psychotic responses. Among these are approach in place of avoidance behavior (beginning by learning to actively pay attention to the therapist), the self-scrutinizing or self-analytic response which substitutes for impulsive need gratification or flight, (such as thinking or social behavior which increases perceptual input). The major condition for the acquisition of these responses is the therapist's anxiety-reducing behavior. This includes his toleration of the patient's feelings and his own, and his ability to analyze and communicate both. As the patient tentatively tries new responses in the therapeutic situation, they become acquired in so far as they are reinforced by being anxiety reducing. For example, a successful self-analytic response which staves off a catatonic episode reassures the patient that that he is not so much as the mercy of inner and outer events. As the repertory of responses available to the patient increases, it becomes less necessary for him to employ these methods of anxiety reduction reflected in psychotic behavior. Further, the patient's observation of the therapist's self-analytic behavior makes it easier for him to establish their similarity of experience.

In the later phases of treatment there is additional insight learning reflected in the patient's increased clarity of representation and of communication to the doctor. This is the perception of bonds between symbols and signs and what they stand for—becoming more clearly aware of what one is talking about. This kind of insight helps to specify what is tension reducing for the patient, it facilitates the progressive exploration of his fantasy systems, and it reduces the possibility of using fantasies for purposes of tension reduction, thus encouraging him to engage in more real life activity.

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PATTERNS AND COURSE OF SCHIZOPHRENIA IN THE DEAF[1]

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An investigation of schizophrenia in the deaf segment of a population affords an excellent opportunity to examine the incidence and clinical symptomatology of this type of psychosis in the presence of a severe perceptual defect. In particular, as the common factor of deafness cuts across the usual cultural and socioeconomic boundaries, it is possible through such an investigation to assess significant trends determined by these influences.

The present study, which got under way in September 1955, covers New York State and is still in progress. For the purpose of uniformity, deafness has been defined as a "stress producing hearing loss at an early age, making effective auditory contact with the world impossible and necessitating special educative efforts" (9). The schizophrenic population drawn upon for this report consists of hospitalized deaf individuals and ambulatory clinic cases seen during the period of our project.

From a theoretical point of view, a study of schizophrenia in the deaf is of general importance, as it may contribute materially to our knowledge of the disease in all populations. By appraising those factors particularly apparent in the deaf and widely believed to be at work in the pathoplastic formation of the schizophrenic process, it should be possible to test some current theories on the etiology of schizophrenia. If this type of psychosis is a result of stress of an interpersonal nature (2, 12), and deafness causes more than the average degree of stress (19, 21), then schizophrenia should occur at an earlier age, in a more severe form, or more frequently in a deaf than in a hearing population.

Another theory is that individuals with characterological inadequacies, such as weakness of the ego or maturational deficiency, are particularly prone to a malignant course of the disease. In the opinion of many workers, the personality defects most common in the deaf include rigidity, ego weakness, and general immaturity (3, 4, 5, 13, 20). If these assumptions are valid, an increased prevalence of severe schizophrenia forms among the deaf should be readily demonstrable. On the other hand, it might be argued that a sheltered life and a lesser degree of maturity typify the existential conditions of the deaf and somehow operate in a protective fashion. Hence, the deaf might be expected to be less vulnerable, on the average, to schizophrenic phenomena than the hearing.

In any case, a well studied deaf population is certain to provide valuable information on the extent to which the prevalence of schizophrenia may be varied by the cumulative effect of (a) difficulties in communication and social interaction, (b) additional frustrations arising from intrafamily disorganization, residential school living, or inadequate educational and vocational opportunities, and (c) limitations as to choice of mate (16).

Before these factors are evaluated, it would be well to consider the more general question of whether or not schizophrenia as diagnosed in the deaf represents the same clinical entity as the set of manifestations so designated in the hearing.

[1] This report is the seventh in a series on the progress of the Mental Health Project for the Deaf, which is being conducted by the Department of Medical Genetics of the New York State Psychiatric Institute, Columbia University, aided by a grant from the Office of Vocational Rehabilitation of the U.S. Department of Health, Education, and Welfare. The report was presented as part of a symposium on "Therapy" at the New York State Divisional Meeting of the American Psychiatric Association, New York City, November, 1957.

Generally speaking, a psychiatric diagnosis in the deaf is necessarily a lengthy procedure. In an interview with an individual who can only communicate manually, it is difficult to determine any thought disturbance that is not absolutely blatant. The language itself is only an approximation, and interpretations are open to subjective coloring. To the extent that some degree of speech and lip reading ability is present, it is possible to ascertain the presence of a thought disorder. Occasionally the written word is helpful in making apparent a loosened connection of ideas and associations. A primary task is to differentiate a schizophrenic disturbance from simply poor grammatic construction which may be due to lack of education or failure to acquire the proper tools for smooth expression. Of course, such educational failure, if extended over a period of years in a non-defective deaf individual, may in itself be suggestive of schizophrenia.

Furthermore, because of the facial grimacing and animated gesticulation necessitated by the use of sign language, the affective response of the deaf schizophrenic is likely to appear fairly appropriate and unblunted, except in severe cases. Prolonged observation is usually required to uncover suggestive clues, such as a slight but persistent inappropriateness of mood, defects in attention-span, autistic thinking, and the like.

Diagnostic obstacles of this kind are common in dealing with deaf people, but can be overcome by specialized clinical training, a knowledge of the deaf and their language, and a willingness to expend time and patience. In the diagnostic procedure used in our project, certain characteristic symptomatic manifestations of the schizophrenic deaf have become apparent. They may be illustrated by the following case abstracts:

A slowly progressive course with recurrent acute episodes was observed in J.R., a 38 year old night watchman, deaf either since birth or his first year of life, who has been hospitalized several times, usually because of what was described as episodes of "impulsive aggressive bizarre behavior." The aggressive outbursts either followed some minor frustration or were entirely unprovoked. When interviewed in sign language, he grimaced excitedly but answered no questions, repeating through signs only those words that were used in the question. Subsequent attempts at communication elicited a manual word salad with an occasional delusional fragment.

An acute exacerbation of a progressive but previously unrecognized process was seen in M.B., an 18 year old congenitally deaf female high school student. After several years of much scholastic achievement but little social success, she required hospitalization following a two week episode of acute disturbance. She postured, verbalized nonsense, was often incontinent and smeared her feces. When interviewed she shuffled manneristically and merely repeated in signs the questions she was asked.

An example of a paranoid development in a case previously marked only by such behavioral difficulties as temper tantrums and disobedience is J.T., a 16 year old congenitally deaf student of a residential school. He was hospitalized after a prolonged borderline adjustment, with repeated episodes of sudden aggressive outbursts towards his mother, grandmother, and others. For several months he behaved well in the ward, and no gross evidence of thinking disorder was apparent. He formed a warm bond of friendship with one of the female attendants. Then one day, suddenly hallucinating, he reported seeing a man who conveyed to him in signs the words "sex! dirty! evil!" At the same time, he claimed to have "heard and felt" the man say these words. Later that day, he struck a male occupational therapist because he felt impelled by the force of his hallucinated experience to do so. At every interview, when asked to explain his explosive behavior, he

persisted in relating two rather irrelevant incidents of previous years.

D.A., a congenitally deaf man, unemployed at the age of 27, has a history of chronic maladjustment at a number of schools for the deaf. Of more than average intelligence, he has nevertheless been unable to make a satisfactory vocational or social adjustment. His relationships with people have been complicated by frequent temper outbursts and hostile assaults. At each therapeutic session, he retold an incident in which his father, two years previously, had thrown away his favorite Tyrolean hat. It was the thought of this incident that gave rise to his frequent explosive rages at home. No clinical evidence could be obtained for hallucinatory, delusional, or catatonic phenomena.

The most characteristic symptom in the first two cases may be described as an echolalic echopraxia, in which the patient repeats in a stereotyped way in sign language the questions he is asked. This symptom is especially presented by the severely disturbed. Noted in patients with a less disorganizing degree of disturbance is the repetitious preoccupation with minor events which may have occurred years prior to the overt onset of illness, as in the latter two cases. In the majority of hospitalized cases, including those initially classified as "episode of excitement," the clinical picture in deaf schizophrenics seems to be dominated by behavioral disturbances, rather than disordered affect and thought.

Seen frequently in hearing children, this type of disturbance may be a reflection of immaturity, with poorly developed control machinery (superego). If so, it is consonant with the hypothesis that audition plays an important role in the development and operation of conscience (7). At the same time it should be noted that the behavior disorder may be foremost because the deaf are oriented toward action rather than thought. Communication and self-expression for many deaf persons depend on motor activity; for instance, signing, grimacing and resorting to facial mimicry. Thus the emotions of fear and rage are more likely to be expressed in the form of grossly disturbed behavior, than observed as disorganized thought processes or verbal affective display.

As to auditory hallucinations in cases of early total deafness, it will be recalled that one of the four cases described claimed to have had such an experience. On close questioning, however, the given type of hallucination seemed mediated through the proprioceptive and vibratory senses which are not affected by the hearing loss. Figure 1 shows the attempt of another schizophrenic patient, deaf since the age of 13 months, to illustrate by means of a drawing his suddenly acquired ability to hear the voice of God. The projection of words as coming from the external world defines this experience as hallucinatory, although the mediation through wires raises the question of whether it is strictly auditory in character.

Regarding the use of projective tests, it may be noted that regular test procedures for evaluating the deaf have not been standardized (11). Although they are capable of providing much useful information about thought and personality dynamics, their diagnostic usefulness remains limited until they are revised in such a way that situations and words are equally comprehensible and meaningful to hearing and nonhearing schizophrenics, the two groups to be compared. At the present time, this has been done only in the case of certain psychometric scales.

At this point it is too early to make definite statements about the treatment method of choice or the adequacy of therapeutic results observed so far. There is reason to believe, however, that a number of patients have responded, in varying degree, to the pharmacological and physical modalities of treatment, combined with supportive psychotherapy. For example, the

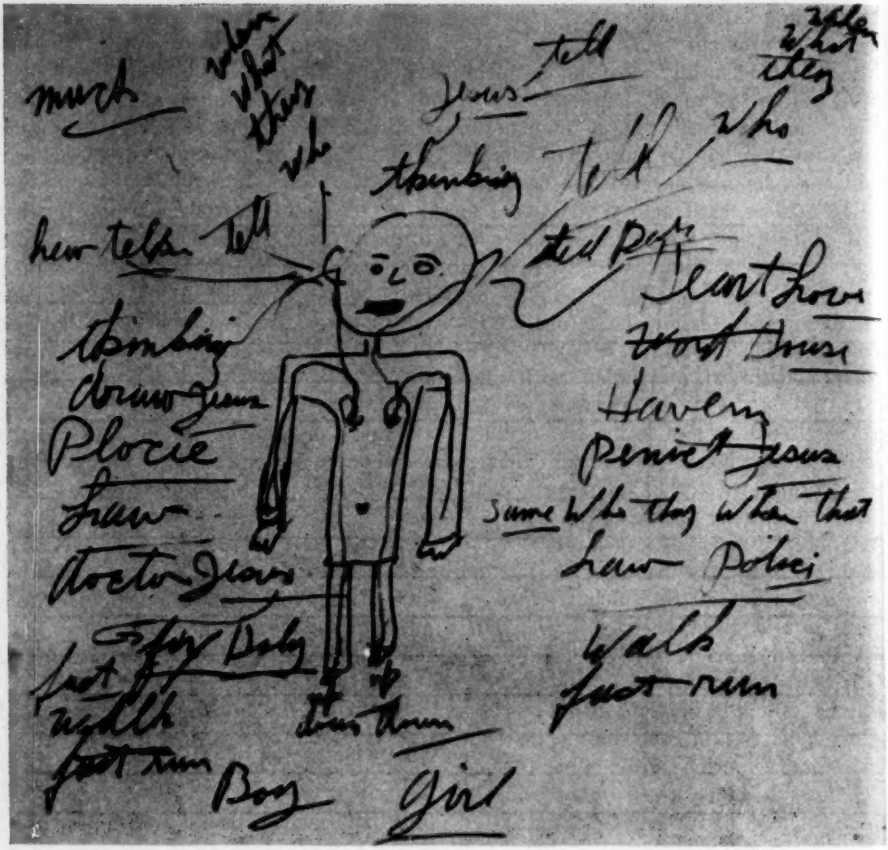

FIG. 1. Auditory hallucinations depicted by a deaf schizophrenic male

catatonic girl, whose history was briefly described, remained in the hospital about a year. During this time she received, successively, thorazine, insulin, and ECT, in addition to regular psychotherapeutic sessions. Upon discharge she was free of psychotic symptoms and has recently resumed her educational work.

Although the limitations of any depth form of psychotherapy in the schizophrenic deaf are as pronounced as in the hearing (6), this area remains under continuing study. Obviously, major problems exist on both sides of the two-way street of communication. Often, physician and patient are unable to understand each other, not only because of obstructions in the physical means of exchanging ideas, but also because of limitations in abstract thinking imposed on the deaf by the perceptual defect and the illness. Frequent corollaries are a complete lack of awareness that a health problem exists and a consequent absence of motivation for treatment (14).

Nevertheless, no one will deny that the deaf are entitled to the same quality of psychiatric care as is available for the hearing, although it is evident that this task requires specially trained and highly

skilled personnel. To this end, our project has established a training program with the support of various organizations for the deaf. We hope to be able to demonstrate that the schizophrenic deaf can benefit from modern diagnostic and therapeutic facilities to the same extent as the hearing (17).

In general, our conclusion is that schizophrenia in the deaf is basically the same clinical entity as in the hearing. It is therefore appropriate to compare data on age of onset, clinical course, and the relative frequency of the disease in the two groups. For this analysis, we have used the records of all 242 psychotic deaf individuals who represented the deaf population of New York State Mental Hospitals in 1956.

In Table 1 it will be seen that 102 patients or 47.5 per cent were classified as schizophrenic, as compared with 57.2 per cent in the non–deaf hospital population. The most striking additional feature of this distribution is the unusually high proportion of deaf patients classified under psychosis with mental deficiency (25.6 per cent of 215 cases had been given an official hospital diagnosis at the time of this analysis). These presumably retarded patients may include a large group in which the diagnosis of psychosis with mental deficiency represents a "wastebasket" classification for any deaf person who, at one time or another, shows signs of emotional disturbance. It may be assumed that such inaccurate diagnoses account for the deficit observed in the other categories, including schizophrenia.

Among the deaf schizophrenics, there is no evidence for a preponderance of paranoid symptoms. In our series, 50 per cent have been diagnosed as predominantly paranoid, a rate not significantly higher than that found in hearing schizophrenics. As a matter of fact, the group of those born deaf or becoming deaf early in life can be described as overly trusting when compared with the hearing, or with those people deafened later in life, many of whom may show a tendency to suspiciousness.

TABLE 1

Distribution of Mental Disorders Among New York State Mental Hospital Patients (101,581 in 1954)

	Number of Deaf Patients			Per cent of Hospital Population	
	Male	Female	Total	Deaf Patients	Hearing Patients
Schizophrenia	60	42	102	47.5	57.2
Psychosis with mental deficiency	28	27	55	25.6	3.4
Senile & arteriosclerotic psychoses	5	12	17	7.9	14.6
Cycloid & involutional psychoses	1	11	12	5.6	9.1
Organic psychoses	13	3	16	7.4	12.2
Other behavior disorders	7	6	13	6.0	3.5
Undiagnosed	15	12	27		
Total	129	113	242	100.0	100.0

Data on average length of hospitalization per admission and percentage of relapse are still incomplete, requiring extended follow–up studies. According to the results of our preliminary analysis, however, the average age of deaf schizophrenic patients on first admission is 32.6 years. While this figure appears rather high, it does not differ significantly from the comparable age of 32.4 years for hearing schizophrenics. Of course, many of the latter may have been treated in clinics, private sanatoria, emergency wards or veterans hospitals before first admission to a state hospital, while deaf patients rarely have any prior psychiatric contact.

During hospitalization, deaf patients included in our study have exhibited no more severe form of illness than their hearing counterparts. There is reason to believe, however, that the duration of their stay often depends upon social factors unrelated to the intensity of their conditions.

Turning to the prevalence of schizophrenia in the total deaf population, and using our incomplete count of 9,321 deaf

New York State residents over age 14, one obtains a tentative estimate of 2.5 per cent for the expectancy rate in this special population, as against the one per cent rate found in the hearing. The calculations for both groups, using the abridged Weinberg method, are based on the assumption that there is one nonhospitalized schizophrenic for every two in a hospital.

In comparing the schizophrenia rates for deaf and hearing populations, we are aware of certain pitfalls. The gathering of names and the classification of deaf individuals, both in and out of hospitals, has been a prolonged and tedious process, and possible inaccuracies in the census-taking in either group may yet bias any comparison. Differences in average length of hospitalization between the hearing and the deaf would have a similar effect. Further, as previously noted, the large percentage of deaf patients diagnostically classified as "psychosis with mental deficiency" should be viewed with some reservation. With the more thorough communication made possible by a knowledge of sign language, many of these defectives appear to be schizophrenics with normal intellectual capacities. Finally, an important influence might be a difference between the hearing and deaf groups in the ratio of hospitalized to nonhospitalized schizophrenics.

Therefore, the overall schizophrenia expectancy rate of 2.5 per cent in this special population must remain tentative. At the present time it is not clear whether early total deafness is associated—either causally or otherwise—with any significant change in the expectancy of schizophrenia, and whether the change is toward an increase or a decrease in the occurrence of this disorder.

Should some increase be verified, an analysis of the picture would necessarily include consideration of the operation of certain genetic and demographic principles. In line with current genetic theories, the potentiality for developing a schizophrenic process is determined by a specific recessive factor assumed to produce some "metabolic defect in the enzymatic range" (1, 8). It is also known that nearly one-half of all deafness cases are genetically determined, apparently following a recessive type of transmission (18). Since mating patterns which favor the manifestation of one recessive condition may produce an increased manifestation of others, such possibilities as an increased consanguinity rate in the parents of deaf schizophrenics must be taken into account in any hypothesis.

With about 47 per cent of the deaf population in America married and the majority of their mates selected from the same group (3), it is obvious that we are dealing with a population forming an *isolate*. Defined as a randomly mating population group wherein an individual can find his mate (10), an isolate may be formed for geographical or ethnic reasons or, as here, because of a common affliction. In such an isolate, there will be an increased chance of two heterozygous carriers of recessive genes marrying and producing homozygous offspring. If an isolate is composed of persons with a common gene-specific defect, this chance becomes a virtual certainty. The consequent shrinkage in the genetic pool of available marriage partners may then account for any higher prevalence of schizophrenia observed in the deaf.

On the other hand, it cannot be precluded at this time that some modifying genes providing more effective defense reactions to a schizophrenic process may be associated with gene-specific forms of deafness.

In conclusion, it has been noted that unless existing theories regarding schizophrenia can be substantiated in the special laboratory afforded by a deaf population, their general validity may well be open to question. While an investigation of schizophrenia in the deaf, admittedly, is fraught with many technical and interpretative difficulties, its results are bound

to make a valuable contribution to our knowledge of the illness.

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A CONSIDERATION OF THE THERAPEUTIC USE OF MUSIC IN PSYCHIATRIC ILLNESS

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The history of psychiatry is replete with examples of treatment devices the effectiveness of which is largely understood empirically. The usefulness of some of these therapies is accepted beyond question, but the theory and mechanisms of the therapy may be less well understood; or in any event, the understanding has come long after the therapy had been used for generations or centuries. An example of this would be hydrotherapy, whose value as a treatment for the emotionally disturbed was recognized in ancient times. The occupational and recreational therapies have long histories, although they have been understood on a scientific basis only in recent times. As a modern example, the mechanism of electroconvulsive therapy remains almost completely obscure.

The use of music as a therapeutic device also has a long history. Fund–raisers for music therapy organizations will often make reference to the biblical story of David singing and playing for Saul during the latter's depressions. There is more than one reference to alleged healing qualities of music in early medical writings (17, 20). At the present time, music is being rather widely used in psychiatric hospitals. Many states have recognized licenses for music therapists, and universities and music conservatories offer courses in so–called music therapy. In all likelihood, music is indeed a useful adjunct to the recreational therapies of the average modern hospital. But there are few guides as to what constitutes a proper use of it; there is almost no understanding of the theory behind its use; and it has not been really established that there is such a thing as music therapy. Whatever claims may be made by overenthusiastic workers from time to time, there is thus far little evidence that music can be properly considered as a medicine with curative properties in and of itself, apart from the recreational opportunities which it may afford. But since so–called music therapy has a very long history and is practiced more than ever today, it does seem in order to consider its theoretical and practical implications.

A discussion of theoretical concepts concerned with therapeutic use of music must begin with a consideration of the nature of music as an art. It should be noted first of all that music is an abstract art. Music becomes less abstract when it attempts to be programmatic, descriptive, or has associated words, as in a song. Here the response may be influenced by word ideas; but music never completely loses its essentially abstract qualities. Second, it is a time art. In the case of graphic art, one sees the product first as a whole, then in its parts. With music, the listener must wait until the piece is over, to put it together, so to speak, and during its performance it may quite absorb consciousness. Third, form or organization in music is concerned in large measure with various kinds of repetitions. Music is generally composed, for example, of periodic repetitions of rhythm, beats or measures, and tends to divide itself into groups of 2 or 3 beats, or multiples of these. In Western music, there is a basic tonality or key, maintained or recurring. Melodically there are repetitions of sequences, and so on.

As an art, music is unquestionably a potent form of expression, capable of arousing a variety of strong emotions and

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in some instances word and picture ideas, the nature of which may vary considerably from individual to individual. Some generalizations concerning the response to music can be found in the psychiatric literature. General factors in the response to music have been described by Kohut and Levarie (12) as follows: "Music gives various things to different individuals. One may sit with closed eyes and open mouth and drink in music, ... another enjoys mainly the rhythm: he cannot sit still; he has to move his fingers and hands, his feet, his head in enjoyable kinesthetic discharge of the tension created by the rhythmical sounds. For a third, music is mainly enjoyable as a group experience.... A fourth may find the sublimated gratification of a long forgotten curiosity.... A fifth identifies himself with the composer or performer and finds a vicarious fulfilment of ambitions and exhibitionistic wishes." As to the essential elements involved in the enjoyment of music, it has often been suggested that this is based upon very early or primitive instinctual strivings (6, 12, 19). Indeed it is believed by some that at least part of the receptivity to music is based upon stimulation of sub–cortical centers (2). Sterba (19) considers it proven that "music is based on anal and narcissistic instinctual foundations." He also regards the "pleasure in motion as the essence of the musical experience." Pfeifer (15) has suggested that music is "pure libido symbolism." In addition he has advanced the theory that listening to music so completely occupies the consciousness of the individual that it leads to the release of unconscious fantasies. Coriat (6) believes that a "compulsive repetition" is inherent in music, which gives rise to a narcissistic gratification in listening to music. In terms of mechanisms, he believes that this gratification results from the "working off" of the so–called "repetition compulsion." Kohut and Levarie (12) have further advanced a theory as to the "specifically musical" element in the enjoyment of listening to music, which utilizes broader and more technical concepts of music. Sounds, they point out, are originally chaotic and therefore threatening to the infant, and mastery of his fear of them emerges as he comes to understand their meaning. The meaning of musical sounds, in contrast to all other sounds, cannot be put into words, but is dependent upon an understanding of the musical organization itself, a fact which may account in part for the special pleasure derived from music in contrast to other sounds. Elements in such organization, they say, are inherent in the form of the composition, the tonality, the regular meter, the repetition, and the use of familiar instruments. They believe that the condition for the enjoyment of music rests in "the coexistence of the understanding ego function with the ability to experience primitive id mechanisms." They suggest that the average musical composition, which begins with consonance, deviates into dissonance, and returns to consonance at the end, repeats the original job of comprehension, which resulted in the overcoming of fear of sound. This the resolution of tensions, created in the listener by the deviation into dissonance, leads to "liberated energy", from which the basic pleasure stems.

These formulations are in general highly theoretical and speculative. It is possible, however, to formulate a few simple generalizations concerning the response to music which could be easily supported, at least in terms of experience. First, music is capable of arousing various emotions, or at least of exciting or depressing the average individual. Second, the average individual begins to respond to music rather early in life. Indeed, it would appear that interest in and receptivity to music is strongest during the early childhood of the average person. It could be further said that the response to music is influenced by variations in the interest in music and tonal and artistic receptivity of the individual.

Thus, the response to music of an individual who creates or plays music may be different from that of a passive listener. An important feature in the response to music of many individuals is the repetition of the music in fantasy, or in humming or whistling. Any individual may at times be haunted by a tune sometimes to the point of unpleasantness. That the music in such a case may be associated with word ideas will be easily discovered by anyone who attempts to analyze some haunting refrain which he cannot "get out of his head." Music may indeed serve to release fantasies but may also serve as a substitute for the fantasy, when it is repeated in one's mind (3, 10). The response to music in the individual is further influenced by the personal associations which he may have for the music. It is influenced in all likelihood by his mood at the time of listening, and by the setting in which it is performed. The response is certainly influenced by cultural factors. For example, the average American may easily recognize a love song as such in his own or European music, but may miss this completely in an American Indian song. The individual becomes accustomed, in other words, to music clichés which form a part of his cultural experience. The response to music finally may be influenced by accompanying words or descriptions, such as in songs, program music, or dramatic pieces.

It can easily be seen from the above descriptions, as well as from formulations to be found in the literature, that the response to music is extremely complex and difficult to predict for the individual composition or person. Although there have been attempts to designate various musical compositions as happy or sad, exciting or depressing, stirring, passionate, nostalgic and so on, most of these attempts would appear to fail by their very nature. The simple fact of the matter is that "Home On The Range" might make one person happy, another sad, another irritated, and another nostalgic. It is possible, of course, to make certain predictions in terms of cultural clichés. For example, a slow march in the minor mode is funereal in our culture; bells and organ chords are church–like, etc. But difficult as it may be to predict the response of a normal individual to particular music, the matter becomes even more complex when the factor of psychopathology is added. There arises the question as to whether an emotionally disturbed person would respond to a particular piece of music as would a normal person, or whether a patient would respond as he did prior to his illness; or stated differently, whether there exists a phenomenon which could be described as a psychopathologic response to music.

Although there are more unanswered than answered questions in the area of music and psychiatry, there is much evidence to suggest that there is such a thing as a psychopathologic response to music. Furthermore, people suffering from psychopathologic states may, in certain instances, react in a distinct and unusual manner to music, which may at times be described accurately and even be predicted. Evidence for this rests in some of the following examples. There are several recorded cases of patients with epilepsy who experienced convulsions upon hearing music or certain pieces of music (7). Musical hallucinations have been observed in epileptic, organic, and schizophrenic patients. Musical obsessions, that is obsessive repetition in fantasy of musical themes, may be more frequent than is commonly imagined. Langeluddeke (13) presented experimental evidence that schizophrenic, manic–depressive and organic patients responded to rhythm and meter in a manner different from healthy individuals and from each other. Two recent studies concerning responses to specific pieces of music of patients with various psychopathologic states suggested that such states tended to alter the response to music in a predictable manner (18, 21). A study

of the reaction to music of autistic children suggested an unusual and peculiar absorption in music and utilization of it as an integral part of the fantasy life (16). These children oftentimes become intensely absorbed to the exclusion of other things; they may be capable of a fantastic memory for and reproduction of music; and they appear to use it as a principal emotional outlet and occasionally to communicate with it.

An example of a psychopathologic response to music was encountered by the writer in a twenty-one year old male schizophrenic patient, who was admitted to the Payne Whitney Clinic following a suicidal attempt. Principal psychopathologic features included depression, anxiety, impulsive acting out, sexual disturbances and dissociative episodes. The patient was under the care of another therapist, but was brought to the author's attention because of a symptom of obsessive repetition in fantasy of a song called "My Ship", which was sung by the late Gertrude Lawrence in "Lady In The Dark". The patient associated Miss Lawrence, and therefore the song, with his mother, who also sang. Examination revealed that obsessive repetition of tunes was a frequent occurrence in the patient and was associated with anxiety. In fact, he admitted to meditating upon melodic fragments during his interviews with the therapist, especially when he became tense. He expressed a distaste for music of the romantic period, which he claimed moved him too deeply and in an unpleasant manner. The writer played a small musical program for him on the piano, in order to observe his responses. The patient listened to "My Ship" with some boredom. A song by the same composer (Kurt Weill) with a similar melodic idea caused no unusual response. A piece involving constant repetition of musical phrases, as well as a few pieces of music from the romantic era produced no special reaction. One of these, however, a song by Schumann (Ich grolle nicht), produced a most unusual response. The patient suddenly appeared to be out of contact, sat motionless, and stared ahead. He did not speak, or answer to questions. This state lasted for about a minute, after which he said that he had been profoundly disturbed by the music, but could not tell why. He could not identify the piece, and as far as he knew, had never heard it. About two hours later he saw his therapist and omitted this incident from his account of the musical session. When the therapist asked him about it, he claimed to have forgotten it completely, but later remembered. Later that week he saw his mother and found out from her that the song had been one of his favorites as a small child, among the Lieder, which she, as an amateur singer, had sung. He had liked the song so much that he had once learned to play the melody with one finger on the piano. The following week the patient was examined again by the writer. At this time the playing of this music produced no kind of unusual response. He was, however, repeating it in fantasy even as he did with "My Ship". One possible explanation of this response is as follows. The playing of the Schumann song had threatened to release some disturbing unconscious fantasies, probably associated with his mother. One of the patient's defenses was an obsessive one involving music, such as the example of "My Ship", which represented a substitute fantasy. In the same way, the obsessive repetition of the Schumann song served once more as a repressive device. The patient was not able to associate any further to the song, but his musical day-dreams had acquired a new addition.

The evidence that psychopathology may affect the response to music does not necessarily provide a theoretical basis for the therapeutic use of music. Similarly, the numerous experiments concerning the effect of music on physiologic and psychologic functions, often with equivocal results, offer relatively little to suggest that an ef-

fective therapy with music is possible. Altshuler (1) has expressed the belief that "the therapeutic principle of music rests upon close affinity between the human organism and rhythm as well as upon the symbolism inherent in musical sounds", which is perhaps as much as one can say at this time. In any event, if music is to be utilized therapeutically, it must, as with any therapeutic device, be guided by an understanding of the psychopathology, particularly as it affects the response to music. Meanwhile, the most convincing rationale for the therapeutic use of music rests at this time upon certain clinical observations, which suggest that such use, under certain circumstances, may have a limited but beneficial effect upon a psychopathologic state. In a general way the application of music has had a three-fold pattern. First it has been used as a kind of recreational therapy, in which music has been performed for individuals or groups of patients. Second, it has been used as a kind of occupational therapy, in which individuals capable of performing music have worked at some instrument or voice. Third, it has, to a minor extent, been utilized in conjunction with psychotherapy.

The use of music as recreational therapy is probably the most widespread (2, 4, 11). Many hospitals have permitted musicians to perform for emotionally disturbed patients. Claims that music can alter catatonic states are often heard. The fact is that music can at times produce some relaxation, or greater or more appropriate responsiveness in some of these patients during the performance and perhaps shortly thereafter. There is some evidence that music can be an effective relaxant or depressant. For example, a report from one hospital observed that the amount of sedative required for sleep was considerably reduced when quiet music was played on a ward prior to the hour of sleep (5). Music has been played to patients during prolonged baths and other hydrotherapies, and would appear to help induce relaxation. The selection of music for these purposes is naturally difficult. Altshuler and Shebesta (3) have suggested familiar music, although at the Payne Whitney Clinic it has been found best to avoid overly familiar and rhythmic pieces. Music, in addition, has been used with psychotic children with good relaxant effect. In the case of the autistic child, there is little question as to the calming effect that music may have on him. It is a common occurrence to receive a history from the mothers of these children that the record-player or the ability of one of the parents to sing represents an indispensable part of the management of the child at home, and will oftentimes calm him when nothing else will.

The application of music as an occupational therapy has also been initiated in hospitals (2, 4, 11). The principles of such a procedure follow those utilized in occupational therapy in general. It takes into account the psychopathology of the patient, and the teaching program is accordingly influenced by the patient's symptomatology. Long pieces are often avoided. In many instances, the music affords an opportunity for useful and purposeful activity and is quite helpful in this regard. The personality of the music therapist is naturally an important factor in these sessions and it is sometimes difficult to evaluate what role this plays. In our experience and that of other hospitals, the learning and performing of music by the patient has constituted a useful addition to the occupational therapy program.

There has been only a very limited use of music in psychotherapy. Mitchell and Zanker have used it in association with group therapy (14). Frey (8) has used it in association with hypnotic sessions. However, he has been most interested in the fantasies which the music has evoked, and also certain color reactions, which he felt were associated with particular kinds of music. Some therapists have de-

scribed psychotherapy with patients who are musical, in which musical responses, memories, or fantasies formed an important part of the therapy (9); and Coriat has remarked on the frequency with which musical memories may enter into psychoanalysis (6). But there has been comparatively little use of music played during the psychotherapeutic session to promote associations in the patient, although the ability of music to stimulate abreaction has been often noted (2, 14, 21).

A therapeutic use of music in the treatment of autistic children has been previously described by the author (16). Many therapists who treat these children routinely sing to them, and utilize music in some manner as one of the means in helping to make contact and to diminish anxiety. In the opinion of the author, observations of the reactions to music of the autistic child provide the most convincing evidence for a therapeutic value which music may have.

At the present time, it would seem therefore that the use of music in the treatment of patients with psychological disorders has a certain value. The theoretical basis for such a use remains obscure, as do the principles guiding it. It is possible that a more effective use will emerge as understanding of the relation between the response to music and psychopathology increases. Indeed the study of this relation may represent the most hopeful area for investigation at this time.

SUMMARY AND CONCLUSIONS

1. Theoretical formulations concerning the response to music have been reviewed. There is thus far little convincing theoretical or experimental evidence to explain why music may have a therapeutic value.

2. There is evidence to suggest that psychopathology may affect the response to music, sometimes in a distinct and predictable manner.

3. The various uses of music in treatment of psychiatric patients have been reviewed. These include, in the main, its use as a form of occupational or recreational therapy, and in conjunction with psychotherapy. Such uses would appear to have some therapeutic value.

4. An effective therapeutic use of music would appear to depend upon an understanding of the relation between psychopathology and the response to music.

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BRIEF COMMUNICATION

THE CLINICAL VALUE OF THE POLLICO-MENTAL REFLEX IN NEUROPATHOLOGY

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The literature on the palmo–mental reflex reveals serious differences of opinion as to its clinical value. In 1920, Marinesco and Radovici (10) described a reflex, the palmo–mental reflex, which they obtained in 50 per cent of normal adults and in 74 per cent of normal infants under one month of age. Many authors subsequently investigated this interesting reflex: Thompson (14), Blake and Kunkle (2), Burton and Miller (4), McLaughlin and Haines (11), Sarno (13), Juster (8), de Castro (6), Cornil (5), Moldaver (12), Magnusson and Wernstedt (9), Benedek and von Angyal (1), Golla and Antonovich (7) and Bracha (3). Some of these authors attempted to make modifications.

MATERIAL AND METHODS

The writer, terming his modification the pollico–mental reflex, noted the following phenomenon in patients suffering from disturbances in the premotor area of the frontal lobe (Broadman 6): Stroking the volar surface of the terminal phalange of the thumb with a sharp object, such as a Yale key, evoked a brisk contraction of the mentalis muscle on the same side, and sometimes on the other side as well. That is, the reflex was noted on the side of the body opposite to the cerebral lesion. In many cases the response obtained by stroking the thumb was stronger than that obtained by stroking the thenar eminence; and, in some patients, a reflex was obtained by stroking the thumb and not obtained after stroking the thenar eminence and *vice versa*. In some cases the reflex was obtainable by stroking the other distal phalanges of the hand as well.

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Initially, on repeated testing of the same patients, it was observed that in many cases the reflex was not regularly reproducible. Further observations led to the conclusion that in order to consider the sign as positive, the reflex should be reproducible inexhaustibly. Thus, in this series, the sign is considered positive only if the reflex could be elicited on at least ten rapidly successive occasions. An exception was made in the case of newborn infants because of their general restlessness and only three strokes to the thumb were applied in each case.

One thousand normal adults up to sixty years of age, 47 infants up to 7 weeks of age and 962 neuropsychiatric patients were examined. Of this latter group, 180 were suffering from neurological conditions without cortical affection, 39 from cortical disturbances without affection of the frontal lobe, 100 from cortical disturbances with affection of the frontal lobe, 31 from centrencephalic epilepsy, 30 from Parkinson's disease, 11 from cerebellar lesions and 378 from mental disturbances without apparent organic neurological disease. One hundred and seventy-three patients were examined while receiving tranquilizer and shock therapy.

RESULTS

A comparison of Table 2 and Table 3 will show that, in cases where the frontal lobe is not affected, the percentage of patients showing the pollico–mental reflex is small. In those cases where the frontal lobe is affected, the percentage showing the pollico–mental reflex is very high.

The cases tested after lobotomy had all been tested prior to operation and no positive reflex had been found. It is of interest

TABLE 1

Classification of Examined Material and Statistical Data

	No. Tested	No. Showing Reflex	% Positive
Normal adults	1000	0	0
Newborn infants	47	39	83
Mental disturbances without apparent organic disease	378	4	1
Patients receiving tranquilizer and shock therapy	173	0	0
Neurological conditions without cortical affection	180	2	1
Centrencephalic epilepsy	31	0	0
Parkinson's disease	30	8	26
Cerebellar lesions	11	0	0
Cortical disturbances without affection of the frontal lobe	39	6	16
Cortical disturbances with affection of the frontal lobe	100	88	88

TABLE 2

Cortical Disturbances Without Affection of the Frontal Lobe

	No. Tested	No. Showing Reflex
Parietal lesions	12	1
Temporal lesions	15	2
Occipital lesions	3	1
Parieto-occipital lesions	4	1
Parieto-temporal lesions	5	1
	39	6

to note that none of the lobotomies with anterior incision exhibited the reflex; whereas *all* of the lobotomies with posterior incision showed a positive pollico–mental reflex.

The two L.S.D. No. 25 intoxications were in healthy volunteers. In the case with a positive pollico–mental sign, the reflex was not present either the day before or the day after the experiment.

The one case of spastic hemiplegia which did not present a positive pollico–mental reflex had an area of ipsilateral anaesthesia which included the thumb.

One case of right premotor glioblastoma and one case of frontal porencephalia were verified at autopsy. In the latter case, the

TABLE 3

Cortical Disturbances With Affection of the Frontal Lobe

	No. Tested	No. Showing Reflex
Isolated premotor lesions	15	14
Status post lobotomy—posterior incision	10	10
Status post lobotomy—anterior incision	5	0
Arteriosclerosis with E.E.G. showing disturbances in frontal area	35	32
Cerebral contusion with E.E.G. showing fronto-temporal disturbances	11	10
Spastic hemiplegia	12	11
Paralytic dementia	3	3
Amyotrophic lateral sclerosis	7	7
L.S.D. No. 25 intoxication	2	1
	100	88

pollico–mental reflex was the only neurological sign which could be elicited. This was true in several other instances.

For example, in the case of a girl of ten exhibiting psychotic symptoms, the only neurological sign was the pollico–mental reflex on the left side. The E.E.G. was negative twice; only at the third testing, two weeks after the reflex had been manifested, did an E.E.G. show positive signs of premotor lesions on the right side.

Another example: Of the 11 cerebral contusions, the ten cases which exhibited the positive sign were originally examined as normal individuals for testing along with several hundred others. They were all soldiers in the Israeli Defense Forces. Upon elicitation of a persistently positive pollico-mental sign, their backgrounds were investigated. It was found that all ten had in the past suffered cerebral contusions from a fall or other accident. They had been hospitalized for some time and then returned to active service. These individuals had either suffered in silence or had made complaints which were brushed aside as malingering. The behaviour of all of them had changed

since their accidents and they were considered as malingerers or as "peculiar". Subsequent E.E.G. showed fronto–temporal disturbances.

DISCUSSION

The pollico–mental reflex was found positive in organic neurological cases only (it was not found in 1000 normal subjects tested) as distinct from reports of the palmo–mental sign of Marinesco and Radovici being positive in up to 50 per cent of normal adults (2, 10). The pollico–mental reflex appears, therefore, to be a titration of the palmo–mental reflex of Marinesco and Radovici.

In examining Table 3, it is noted that of 15 isolated premotor lesions, 14 manifested a positive pollico–mental reflex. Further: diffuse disturbances of the frontal lobe, such as arteriosclerosis, cerebral contusion with E.E.G. showing frontal disturbances, paralytic dementia and amyotrophic lateral sclerosis showed an extremely high percentage of positive pollico–mental reflex. Still further: all the lobotomies with posterior incision exhibited a positive pollico–mental reflex; whereas none of the lobotomies with anterior incision showed this reflex.

The fact that focal affection of the premotor area and diffuse frontal disturbances with possible affection of the premotor area (due to diffusion of the process) exhibit the pollico–mental reflex, while frontal disturbances without affection of the premotor area (lobotomies with anterior incision) do not exhibit the reflex, justifies the hypothesis that the pollico–mental reflex is not a general frontal sign but is, rather, specifically indicative of lesion in the premotor area of the frontal cortex.

The hypothetical pathway of this pathological reflex may be as follows:

The stimulus is conducted via fast conduction fibres (2) to the thumb centre in the sensory cortex; from there the stimulus passes to the motor thumb area and radiates by facilitation downward to the adjacent facial area in the motor cortex in order to stimulate the muscles of the chin region. This spreading by facilitation of the stimulus to the facial area occurs only in cases of lesion in the premotor areas that in normal conditions inhibit spreading of the stimulus in the motor cortex. In cases of a unilateral lesion the reflex is generally positive on the side of the body contra–lateral to the lesion.

The reason why we see a contraction only of the lower part of the face and not of the total face half is because of the bilateral innervation of the upper face. That is, the inhibitory function of the premotor area of the healthy side of the brain prevents extension of the stimulus from the thumb cortical area to the upper facial cortical area. When the thumb was stroked in cases of severe arteriosclerosis cerebri, contraction was observed, not only of the lower part of the face, but also contraction of the upper face musculature (M. orbicularis oculi) as a result of insufficient inhibition of both the premotor areas. Subjects with unimpaired inhibitory function of their premotor areas do not present the pollico–mental reflex because of the suppression of the extension of the stimulus from the thumb area to the facial area.

From the results, therefore, it would appear that the pollico–mental reflex may be a valuable early neurological sign in the diagnosis of lesions in the premotor area of the frontal cortex.

SUMMARY

A modification of the palmo–mental reflex of Marinesco and Radovici is reported. This modification is termed the pollico–mental reflex.

The pollico–mental reflex is elicited by stroking the volar surface of the terminal phalange of the thumb with a firm pointed object, such as a Yale key, causing a brisk contraction of the mentalis muscle on the same side and sometimes on the other side as well. The sign is considered positive only if reproducible inexhaustibly.

1000 normal adults, 47 newborn infants and 962 neuropsychiatric patients were

tested. None of the normal adults evinced a positive reflex. A negligible percentage of patients without disturbances of the frontal lobe showed a positive pollico–mental reflex. In contrast, 88 per cent of the cases with affection of the frontal lobe had a positive pollico-mental reflex, as did 83 per cent of newborn infants tested.

The hypothesis is offered that the pollico–mental reflex is a pathognomonic sign of an organic lesion in the premotor area. It is suggested that the reflex may be due to insufficient inhibition in the motor cortex as a result of damage in the premotor area.

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BRIEF COMMUNICATION

FIVE-YEAR FOLLOW-UP OF SCHIZOPHRENIC IDENTICAL TWINS ONE OF WHOM WAS LOBOTOMIZED

J. WEATHERLY, M.D. AND H. L. DEABLER, PH.D.[1]

In a previous article (1) schizophrenia was reported in an apparently identical pair of twins, one of whom was lobotomized in July, 1952. The lobotomized twin was given the pseudonym of John; his brother, Tom.

In 1942, at the age of twenty–five, both became acutely schizophrenic within six months of each other although they had been separated by military service for nearly two years and were over one thousand miles apart when first hospitalized. They returned home in 1943, and their adjustments were greatly marred by John's apathy and Tom's preoccupation and depression.

The twins were admitted to the same psychiatric hospital around the first of 1944 and eventually were on the same ward at which time an intense, mutual ambivalence arose, which has persisted.

A comparison of their illnesses for the ten years between the onset in 1942 and John's lobotomy in 1952 shows that Tom generally presented a clinical picture strongly colored by depression, self–recrimination, and projected ideas of worthlessness. He had no outstanding delusions or hallucinations, and his repeated responses to treatment were such that he was able to stay at home for periods as long as two years. John, however, was plagued by many bizarre hallucinations and somatic delusions with attendant severe anxiety. He was more impulsive, made suicidal attempts, showed only transient responses to insulin and electric shock therapy and failed to adjust at home. His condition gradually worsened until he eventually required closely supervised hospitalization with the hope of improvement steadily waning. Because of these factors, John was lobotomized (bilateral modified Freeman–Watts lobotomy) in July, 1952. He was then thirty–five years old.

Following the operation, he began to improve to the extent that he became cheerful, sociable, coarsely humorous, and most importantly, showed steadily lessening concern for the "voices" and delusions that had tortured him so long. He was released from the hospital in February, 1953 and has remained at home since.

His brother Tom, whose psychosis originally was less severe clinically, has not fared as well. One month after his lobotomized twin came home, Tom required hospitalization, at which time he was withdrawn, depressed and confused. After electric shock therapy, definite improvement occurred although he remained passive, indecisive, and exhibited his usual veiled hostility: *e.g.*, "Whatever you say, sir. You're the doctor, and I have to do whatever you say." However, he maintained sufficient improvement to return home in July, 1953. He had to come back to the hospital in November, 1955 and again responded so well to electric shock therapy that he was released in February, 1956.

His recent adjustment pattern at home followed the one displayed on all of his trial visits. He argued bitterly with his twin, was apathetic, unemployable, unsociable, and excessively dependent upon his mother. Nevertheless, he managed to hang on to this

[1] The Gulfport Division, Veterans Administration Center, Biloxi, Mississippi. The authors express their appreciation to the Social Service Departments of the Gulfport Division and Veterans Administration Regional Office, New Orleans, Louisiana, for their cooperation in gathering data for this report.

level of adjustment until the periodic exacerbation of acute symptoms again necessitated his latest hospitalization in February, 1957. At that time he was disheveled, depressed, retarded, self-derogatory, and persistently voiced pessimistic ruminations: "You ain't never gonna' let me out, are you?" This clinical picture persisted until he was given electric shock therapy, which immediately relieved his acute signs and symptoms without altering his basic passive and dependent attitudes.

Twin Tom was given psychological tests on two different occasions since his hospitalization in 1952, the most recent administration being in February, 1957. Testwise, Tom appeared to be very much the same in 1957 as in 1952. In sentence completion items, he still expressed marked feelings of guilt and self-accusatory attitudes, such as, "I despise *myself*," "I am ashamed *of myself*," "I look upon myself *as the saddest human God created*." He expressed a hopelessness for the future, such as, "I don't feel that I *will ever see the daylight and sunshine on the earth no more*." Aggressive tendencies were directed inwardly and revealed in such statements as, "I hate *no one but myself*." Human drawings were nude figures and suggested sexual preoccupation and conflict centering around sexual organs. Depressive components were marked, and schizo-affective indices were outstanding in the record. Little intellectual deterioration was seen, and superficial contact with reality appeared to be maintained as indicated by a fairly high F+% score on the Rorschach. Many of the sentence completion items were the same in 1957 as in 1952, the patient making identical responses at both times, such as, "I need *a new body*" and "I am *ashamed of myself*." There was a marked similarity in the figure drawings, the main difference being that the 1957 drawings were smaller in size, presumably showing an increase in inferiority feelings and constrictive tendencies.

John has had no recent psychological testing; he has ignored all requests that he return for a "check-up".

Tom was last released in June, 1957. No change in his stereotyped behavior at home is expected, and his eventual return to the hospital is anticipated. However, it is also anticipated that he will again respond rapidly to treatment if hospitalization is necessary in the future. For this reason drastic procedures have not been recommended for him.

During the past five years Tom has been hospitalized three times, while his lobotomized twin, John, has continuously maintained an adequate although modest level of extramural adjustment. John is successfully taking vocational training. While he needs support from his teachers, he has been personally able to tolerate such things as teasing by the other students and other minor everyday problems.

In contrast to the free-handed irresponsibility reported in other lobotomized individuals, John has managed his finances well, is never tardy at school, and wants things "just so" at home. He is buying the house his family lives in, takes a keen interest in the grounds, and has gradually purchased appropriate appliances. He has shown sufficient controlled drive to keep himself acceptably occupied and is sociable with his family to the extent that "You can't shut him up." (This amiable garrulousness may be a product of organicity: *e.g.*, "He nearly drives you distracted telling you the same things over and over.")

John, of course, has his ups and downs. At times he has been irritable, and his understanding family has learned not to "cross him" any more than they can help. In August, 1956, he sought outpatient psychiatric treatment because he felt that his memory was bad and that he was confused in his school work. After several psychiatric interviews, however, he felt improved, became opposed to treatment, and finally asked to be discharged. While he is still dependent upon his mother and persists in

heated arguments with his twin, he has obviously found a reasonably happy and productive place in his society.

Although his twin originally seemed to show more prospects for rehabilitation, it is obvious that, of the two, John has made a better adjustment in the five years since his lobotomy. It is also clear that he remains an immature person adjusting at a rather juvenile level. But when one remembers that five years ago he had been requiring almost daily packs and heavy sedation for more than eighteen months, his improvement is soundly impressive and heartening.

SUMMARY

1. This five year report deals with an apparently identical pair of schizophrenic twins one of whom was lobotomized.

2. The lobotomized twin (1952) had a more severe illness originally with a future apparently limited to continued, closely supervised hospitalization. Following lobotomy, he has remained out of the hospital and has maintained a continuous, productive place in his society.

3. The twin who was not lobotomized seemed initially to show more prospects for rehabilitation. However, he has been hospitalized three times in the past five years; his extramural adjustment has been minimal, and he will probably require hospitalization in the future.

4. The results of lobotomy in this case of schizophrenia are considered to be excellent.

REFERENCE

1. Weatherly, J. and Deabler, H. L. Schizophrenia in identical twins one of whom was lobotomized. J. Nerv. & Ment. Dis., 120: 262–267, 1954.